

HP StorageWorks

SAN Switch 2/8V, 2/16V, 2/16N and 4/32 installation guide

Part number: AA-RVULC-TE
Third edition: January 2005



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SAN Switch 2/8V, 2/16V, 2/16N and 4/32 installation guide

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About this guide

This installation guide provides information to help you set up and configure the following HP switches:

- HP StorageWorks SAN Switch 2/8V
- HP StorageWorks SAN Switch 2/16V
- HP StorageWorks SAN Switch 2/16N
- HP StorageWorks SAN Switch 4/32



NOTE: Throughout this guide, information about the SAN Switch 2/16V is applicable to the SAN Switch 2/16N, unless otherwise noted.

“About this Guide” topics include:

- [Overview](#), page 10
- [Conventions](#), page 11
- [Rack stability](#), page 14

Overview

This section covers the following topics:

- [Intended audience](#)
- [Related documentation](#)

Intended audience

This guide is intended for use by system administrators and technicians who are experienced with the following:

- Configuration aspects of customer Storage Area Network (SAN) fabric
- Customer host environment, such as Microsoft Windows or IBM AIX
- The built-in Graphical User Interface (GUI), Advanced Web Tools, for configuring the switches through a supported web browser

Related documentation

Documentation, including white papers and best practices documents, is available via the HP website. Please go to:

<http://www.hp.com/country/us/eng/prodserv/storage.html>

To access SAN Switch related documents:

1. Locate the **Networked storage** section of the web page.
2. Under **Networked storage**, go to the **By type** subsection.
3. Click **SAN infrastructure**. The SAN infrastructure page displays.
4. Locate the **Fibre Channel Switches** section.
5. Locate the **B-Series Fabric** subsection, then go to the **Entry-level** subsection.
6. Select **SAN Switch 2/8V, SAN Switch 2/16V, SAN Switch 2/16N** or **SAN Switch 4/32**. The switch overview page displays.
7. Go to the **product information section**, located on the far right side of the web page.
8. Click **technical documents**.
9. Follow the onscreen instructions to download the applicable documents.

Conventions

Conventions consist of the following:

- Document conventions
- Text symbols
- Equipment symbols

Document conventions

Review the following document conventions.

Document conventions

Element	Convention
Cross-reference links	Blue text: Figure 1
Key and field names, menu items, buttons, and dialog box titles	Bold
File names, application names, and text emphasis	Italics
User input, command and directory names, and system responses (output and messages)	Monospace font COMMAND NAMES are uppercase monospace font unless they are case sensitive
Variables	<monospace, italic font>
Web site addresses	Blue, underlined sans serif font text: http://www.hp.com

Text symbols

The following symbols may be found in the text of this guide. They have the following meanings.



WARNING! Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or death.



CAUTION: Text set off in this manner indicates that failure to follow directions could result in damage to equipment or data.



NOTE: Text set off in this manner presents commentary, sidelights, or interesting points of information.



TIP: Provides helpful hints and shortcuts.

Equipment symbols

The following equipment symbols may be found on hardware for which this guide pertains. They have the following meanings.



Any enclosed surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts.

WARNING: To reduce the risk of personal injury from electrical shock hazards, do not open this enclosure.



Any RJ-45 receptacle marked with these symbols indicates a network interface connection.

WARNING: To reduce the risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.



Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. Contact with this surface could result in injury.

WARNING: To reduce the risk of personal injury from a hot component, allow the surface to cool before touching.



Power supplies or systems marked with these symbols indicate the presence of multiple sources of power.

WARNING: To reduce the risk of personal injury from electrical shock, remove all power cords to completely disconnect power from the power supplies and systems.



Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.

WARNING: To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manually handling material.

Rack stability

Rack stability protects personnel and equipment.



WARNING! To reduce the risk of personal injury or damage to the equipment, be sure that:

- The leveling jacks are extended to the floor.
 - The full weight of the rack rests on the leveling jacks.
 - In single rack installations, the stabilizing feet are attached to the rack.
 - In multiple rack installations, the racks are coupled.
 - Only one rack component is extended at any time. A rack may become unstable if more than one rack component is extended for any reason.
-

Getting help

If you still have a question after reading this guide, contact an HP authorized service provider or access our web site: <http://www.hp.com>.

HP technical support

Telephone numbers for worldwide technical support are listed on the following HP web site: <http://www.hp.com/support/>. From this web site, select the country of origin.

NOTE: For continuous quality improvement, calls may be recorded or monitored.

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

HP Storage web site

The HP web site has the latest information on this product, as well as the latest drivers. Access storage at: <http://www.hp.com/country/us/eng/prodserv/storage.html>. From this web site, select the appropriate product or solution.

HP authorized reseller

For the name of your nearest HP authorized reseller:

- In the United States, call 1-800-345-1518.
- In Canada, call 1-800-263-5868.
- Elsewhere, see the HP web site for locations and telephone numbers: <http://www.hp.com>.

1 Overview

This chapter provides the following information:

- [SAN Switch 2/8V, 2/16V and 2/16N models](#), page 18
- [SAN Switch 4/32 models](#), page 21
- [Upgrading SAN Switch 4/32 ports](#), page 24
- [SAN Switch licensing](#), page 25
- [ISL Trunking groups](#), page 26
- [SAN Switch supported \(optional\) features](#), page 27
- [SAN Switch optional kits](#), page 28

SAN Switch 2/8V, 2/16V and 2/16N models

The following lists HP StorageWorks SAN Switch 2/8V, 2/16V and 2/16N models.

- HP StorageWorks SAN Switch 2/8V and 2/16V include a Two-domain Fabric License. Integrates Zoning and Advanced Web Tools as standard software components.
- HP StorageWorks SAN Switch 2/16N Full Fabric includes a Full-fabric License. Integrates Zoning and Advanced Web Tools as standard software components.
- HP StorageWorks SAN Switch 2/8V or 2/16N Power Pack includes a Full-fabric License. Integrates Zoning and Advanced Web Tools as standard software components. Additionally, Power Pack models provide built-in licenses for all the optional software including Advanced Performance Monitoring (APM), ISL Trunking, Extended Fabric, Remote Switch and Fabric Watch.



NOTE: For SAN Switch 2/8V and SAN Switch 2/16V models only, purchase the Full-fabric Upgrade License to allow four or more switches to operate within a domain.

SAN Switch 2/8V, 2/16V and 2/16N features

The SAN Switch 2/8V, SAN Switch 2/16V and SAN Switch 2/16N are Fibre Channel switches that support link speeds up to 2 Gb/sec. The switches operate in a fabric containing multiple switches or as the only switch in a fabric.

The SAN Switch 2/16N and SAN Switch 2/16V look the same; however, the SAN Switch 2/16N includes a Full-Fabric license. The Full-Fabric license allows more than two switches in the domain.

NOTE: Unless otherwise noted, functionality and features for the 2/16V are applicable to the 2/16N throughout this guide.

The 2/8V, 2/16V and 2/16N provide the following features:

- Air-cooled 1U chassis. Install the switch as a stand-alone unit, or mounted in one of the following HP custom racks:
 - HP 10,000 series Rack
 - HP System/e Rack

- 8 or 16 Fibre Channel ports, with the following characteristics:
 - Automatic negotiation to the highest common speed of all devices connected to port.
 - Port interfaces compatible with small form factor pluggable (SFP) transceivers, both short wavelength (SWL) and long wavelength (LWL).
 - Universal and self-configuring ports: capable of becoming an F_Port (fabric enabled), FL_Port (fabric loop enabled), or E_Port (expansion port).
- One RS-232 serial port, designed to connect to a DTE port.
- One 10/100 Mb/sec Ethernet port with an RJ-45 connector.
- One (SAN Switch 2/8V) or two (SAN Switch 2/16V) built-in power supplies.
- A real-time clock (RTC) with 10-year battery
- Plenum, part number 5697-4919

SAN Switch 2/8V, 2/16V and 2/16N chassis

The following sections illustrate the chassis front and rear panels.

SAN Switch 2/8V, 2/16V and 2/16N—port side

You can see the physical differences between the SAN Switch 2/8V and the SAN Switch 2/16V switches in the following figures. The most noticeable difference is the number of ports. [Figure 1](#) shows the port side of the SAN Switch 2/8V. [Table 1](#) identifies port side components.

All LEDs reside on the port side of the switches. The nonport side is used for air intake. The SAN Switch enclosures have forced-air cooling, with the fans pushing the air from the nonport side of the chassis through the enclosure, and exhausting to the port side.

See “[Interpreting LED activity](#)” on page 64 for a complete description of switch LEDs.

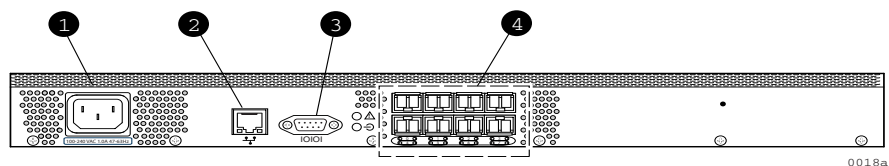


Figure 1 Port side of SAN Switch 2/8V

Table 1 SAN Switch 2/8V port side components

Number	Description
1	AC power receptacle
2	Ethernet port

Table 1 SAN Switch 2/8V port side components

Number	Description
3	Serial port
4	Fibre Channel ports (8)

As shown in [Figure 2](#), the SAN Switch 2/16N and 2/16V integrate sixteen ports, and a second AC power inlet.

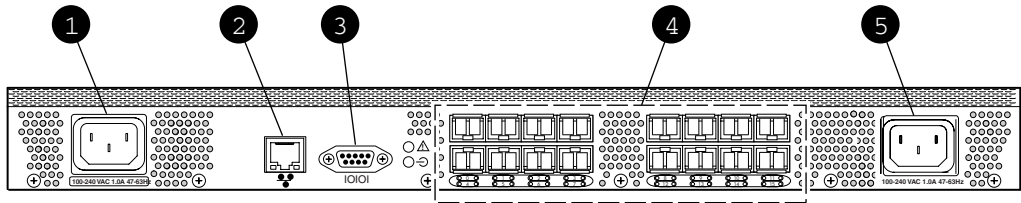


Figure 2 Port side of SAN Switch 2/16V and 2/16N

[Table 2](#) identifies SAN Switch 2/16V port side components.

Table 2 SAN Switch 2/16V and 2/16N port side components

Number	Description
1	AC power receptacle
2	Ethernet port
3	Serial port
4	FC Ports (16)
5	Second AC power receptacle

SAN Switch 2/8V, 2/16V and 2/16N—nonport side

The nonport side is used solely for air flow and for serial number labels. There are two labels on the rear of the chassis; both contain a serial number label for the switch; the left label also contains the 2/8V, 2/16V or 2/16N MAC address and World Wide Name (WWN).

SAN Switch 4/32 models

Each HP StorageWorks SAN Switch 4/32 model ships with a different number of ports activated, as follows:

- HP StorageWorks SAN Switch 4/32 Base, 16 ports activated, includes Zoning and Advanced Web Tools as standard software components.
- HP StorageWorks SAN Switch 4/32 Full, 32 ports activated, includes Zoning and Advanced Web Tools as standard software components.
- HP StorageWorks SAN Switch 4/32 Power Pack, 32 ports activated, includes Advanced Zoning and Advanced Web Tools as standard software components. Additionally, provides integrated licenses for all optional management tools, (including Advanced Performance Monitoring, ISL Trunking, Extended Fabric, Remote Switch and Fabric Watch).

To add ports, see ["Upgrading SAN Switch 4/32 ports"](#) on page 24.

SAN Switch 4/32 features

The HP StorageWorks SAN Switch 4/32 provides the following features:

- Air-cooled 1U chassis
- 32 fixed auto-sensing 1-, 2-, or 4-Gbit/sec Fibre Channel ports, with the following characteristics:
 - Automatic negotiation to the highest common speed of all devices connected to port.
 - Port interfaces compatible with small form factor pluggable (SFP) transceivers, both short wavelength (SWL) and long wavelength (LWL).
 - Universal and self-configuring ports: capable of becoming an F_Port (fabric enabled), FL_Port (fabric loop enabled), or E_Port (expansion port).
- One RS-232 serial port, designed to connect to a DTE port.
- One 10/100 Mb/sec Ethernet port with an RJ-45 connector.
- Two redundant, hot-pluggable universal AC power supplies
- Three redundant, hot-pluggable fans

SAN Switch 4/32 chassis

The following sections illustrate the chassis front and rear panels.

SAN Switch 4/32—port side

Figure 3 shows the port side of the SAN Switch 4/32. Table 3 identifies port side components.

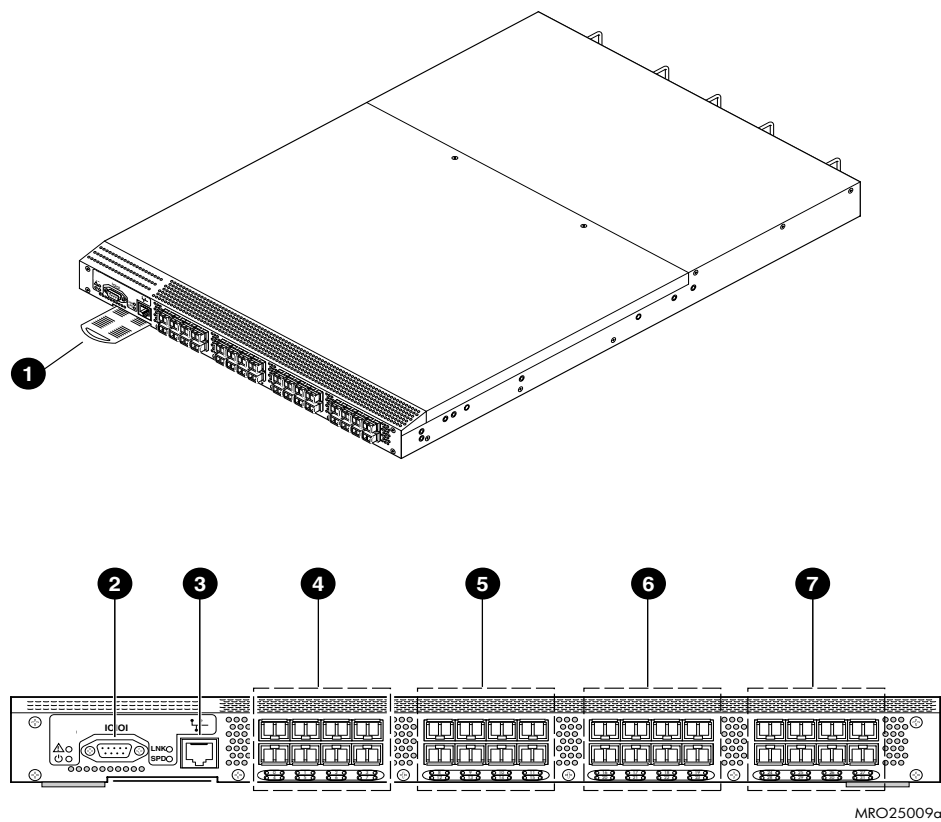


Figure 3 Port side of SAN Switch 4/32

Table 3 SAN Switch 4/32 port side components

Number	Description
1	Switch ID pull-out tab
2	Serial port
3	Ethernet port
4	FC Ports (0-7)

Table 3 SAN Switch 4/32 port side components (continued)

Number	Description
5	FC Ports (8-15)
6	FC Ports (16-23)
7	FC Ports (24-31)

SAN Switch 4/32—nonport side

Figure 4 shows the nonport side of the SAN Switch 4/32, which contains the power supplies (including the AC power inlet, and AC power switch) and fans.

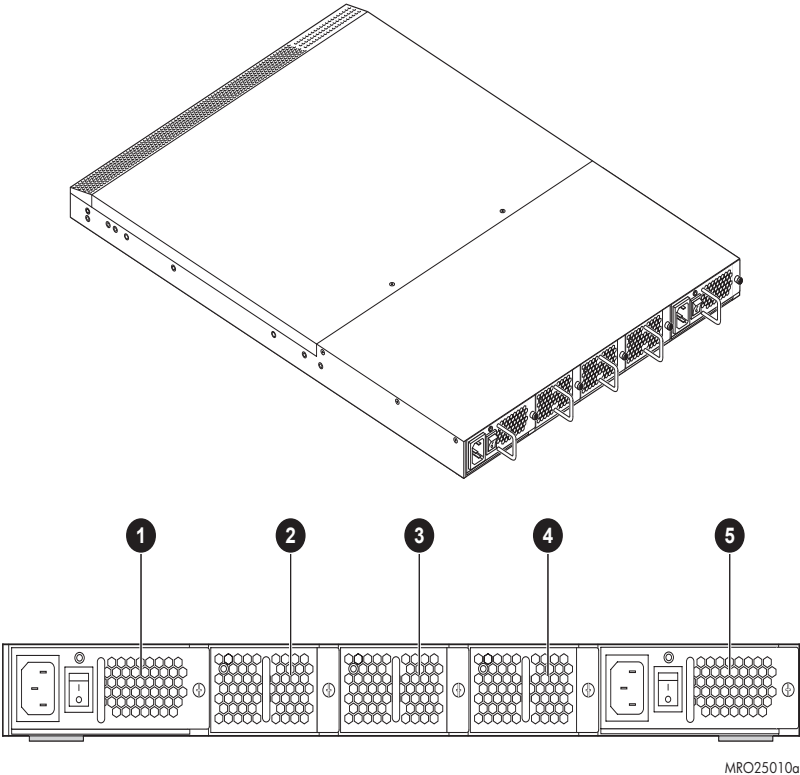


Figure 4 SAN Switch 4/32—nonport side

Table 4 lists the SAN Switch 4/32 nonport side components.

Table 4 SAN Switch 4/32 nonport side components

Number	Description
1	Power supply 2
2	Fan 3
3	Fan 2
4	Fan 1
5	Power supply 1

Upgrading SAN Switch 4/32 ports

The SAN Switch 4/32 is available with either sixteen ports, 0 through 15 (Base model) or thirty two, ports 16 through 32 (Full model) activated.

To activate additional ports, contact your HP representative to purchase the *HP StorageWorks 8-Port Upgrade License*, Part Number T3677A. For example, if your SAN Switch 4/32 shipped with sixteen active ports, purchase one 8-Port Upgrade License to activate ports 16 through 23. Purchase two 8-Port Upgrade Licenses to activate ports 24 through 32.



NOTE: Check port status to verify if the license is pre-installed. For example, use the `portshow` command for ports 16 through 32. If the port status output indicates “Started” and “Licensed”, then all thirty two ports are activated.

-
1. If ports 16 through 32 show no License, purchase the *HP StorageWorks 8-Port Upgrade License*, Part Number T3677A, from an authorized HP representative.

Your HP representative requires the SAN Switch 4/32’s World Wide Number (WWN) in order to assign a license key. Enter the `switchshow` command to obtain the WWN of your SAN Switch 4/32.

2. Install the *HP StorageWorks 8-Port Upgrade License*. The license key is a string of approximately sixteen uppercase and lowercase letters and digits.
 - a. Log in to the SAN Switch 4/32 as `admin`.
 - b. Enter the `licenseadd` command, followed by the license key enclosed in quotation marks.



NOTE: Enter the license key exactly as issued. If you enter it incorrectly, the license will not function properly.

- c. After entering the license key, use the `licenseshow` command to check to see if it is valid.

If a licensed product is not displayed, the license is invalid.



NOTE: After you enter a license, the licensed product is available immediately; the system does not require a reboot.

3. Next, configure the inactive ports. Use the `portstart` command to start the ports. (This command loads the port code, unlike the `portenable` command, which enables the port laser.) For example:

```
portstart 16-32
```

4. Use the `portenable` command to enable the ports. For example:

```
portenable 16-32
```

5. Optionally, use the `portshow` command to verify that the newly activated ports are "Started."

SAN Switch licensing

SAN Switches operate differently in the network depending on the HP StorageWorks domain licenses installed as follows:

- **2-domain Fabric License**—Allows a maximum of two switches to operate within a domain. The SAN Switch 2/8V and SAN Switch 2/16V ship with this license installed.
- **4-domain Fabric License**—Upgrades the current 2-domain Fabric License, allowing a maximum of four switches to operate within a domain. This license is offered for the SAN Switch 2/8V and SAN Switch 2/16V models only
- **Full-fabric License**—Allows four or more switches to operate within a domain. All SAN Switch Power Pack models ship with this license installed.

To determine the type of licensing installed on your SAN Switch, enter the `licenseshow` command at the CLI prompt. A list of the all licenses currently installed on the switch displays, as shown in the following example.

Example

```
switch:admin> licenseshow
AbbbcDefcQxdezdr:
Web license
Zoning license
Fabric license
Remote Switch license
Extended Fabric license
Fabric Watch license
Performance Monitor license
Trunking license
Security license
switch:admin>
```



NOTE: If the licensed feature is listed, the feature is installed and immediately available.

ISL Trunking groups

If your SAN Switch is licensed for ISL trunking, use the trunking groups available on the switch.

The Fibre Channel ports are numbered from left to right, color-coded into groups of four to indicate the groups of ports that can be used in the same interswitch link (ISL) trunking group. The trunking groups are the two or four sets of four ports at the top or at the bottom of the group, as shown in [Figure 5](#).

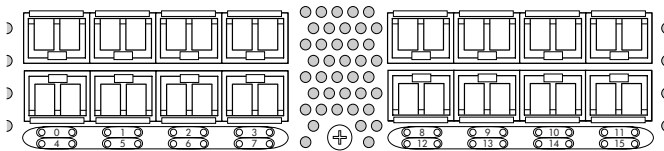


Figure 5 Trunking groups



NOTE: ISL Trunking is optional HP StorageWorks software that allows you to create trunking groups of ISLs between adjacent switches. For more information, see the “ISL Trunking” chapter in the *HP StorageWorks features overview*, located on the Software CD that shipped with your switch.

SAN Switch supported (optional) features

SAN Switches support the following optional software, activated with the purchase of a corresponding license key.

- ISL Trunking
- Fabric Watch
- Advanced Performance Monitoring
- Extended Fabrics
- Remote Switch



NOTE: All SAN Switch Power Pack models ship with these licensed options already enabled.

Refer to the *HP StorageWorks features overview* for the firmware version that you are running for detailed information on these features. All supporting Fabric OS documentation resides on the Software CD that shipped with your switch.

SAN Switch optional kits

Table 5 lists the optional hardware kits.

Table 5 Optional kits

Option	Part Number
HP StorageWorks 4Gb SW 4PK SFP Transceiver	A7448A
HP StorageWorks 4Gb SW SnglePK SFP Transceiver	A7446A
Short wavelength SFP	A6515A* or 300834-B21**
Long wavelength SFP, 10 km	A6516A* or 300835-B21**
Long wavelength SFP, 35 km	300836-B21**
2m LC-to-LC Fibre Channel (fc) cable	C7524A*
2m LC-to-LC multi-mode fc cable	221692-B21**
16m LC-to-LC fc cable	C7525A*
5m LC-to-LC multi-mode fc cable	221692-B22**
50m LC-to-LC fc cable	C7526A*
15m LC-to-LC multi-mode fc cable	221692-B23**
200m LC-to-LC fc cable	C7527A*
30m LC-to-LC multi-mode fc cable	221692-B26**
50m LC-to-LC multi-mode fc cable	221692-B27**
2m LC-to-SC fc cable	C7529A*
2m LC-to-SC multi-mode fc cable	221691-B21**
16m LC-to-SC fc cable	C7530A*
5m LC-to-SC multi-mode fc cable	221691-B21**
15m LC-to-SC multi-mode fc cable	221691-B23**
30m LC-to-SC multi-mode fc cable	221691-B26**
50m LC-to-SC multi-mode fc cable	221691-B27**

Table 5 Optional kits (continued)

Option	Part Number
SC female to SC female adapter	C7534A*
2m LC male to SC male adapter kit	C7540A*

* premerger HP part number

** premerger Compaq part number



NOTE: To obtain the latest information on hardware and software components, go to <http://www.hp.com>.

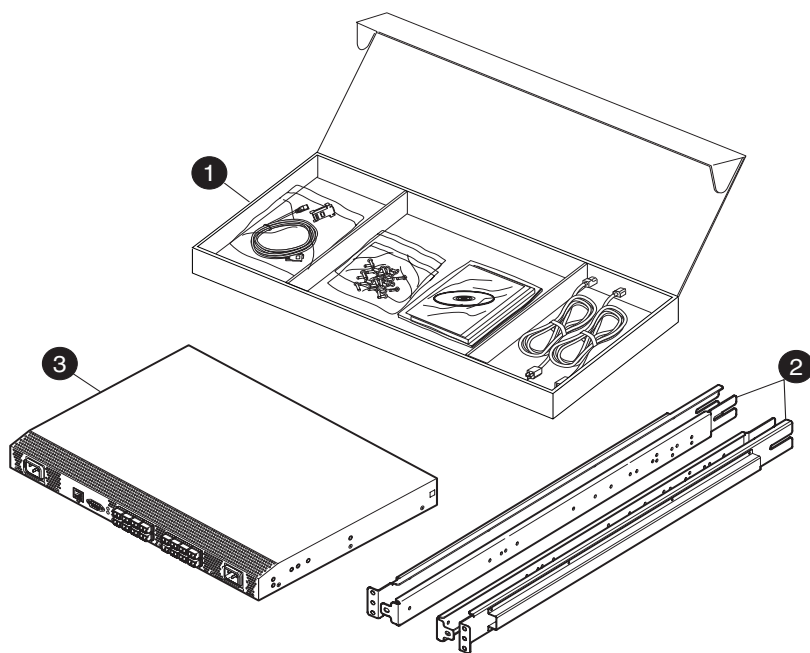
2 Installing and configuring

This chapter provides the following information:

- [SAN Switch shipping carton contents](#), page 32
- [Installation and safety considerations](#), page 34
- [Installing as a stand-alone device](#), page 36
- [Installing the switch in a rack using the SAN Switch Rack Mount Kit](#), page 37
- [Cabling and configuring the SAN Switch](#), page 50
- [Connecting the SAN Switch to the fabric](#), page 51

SAN Switch shipping carton contents

Figure 6 shows the shipping carton contents for the SAN Switch 4/32 specifically. The items shown here ship with all SAN Switch models. See Table 6 for a complete description.



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Figure 6 SAN Switch shipping carton contents

SAN Switch shipping carton contents checklist

Table 6 identifies the carton contents included with your SAN Switch 2/8V, 2/16V, 2/16N or 4/32.

Table 6 SAN Switch shipping carton contents checklist

Item Number	Description
1	<p>One SAN Switch Accessories Box containing:</p> <ul style="list-style-type: none">• One 10 ft. (3.0 m.) RS-232 serial cable; convertible to an RJ-45 connector by removing the adapter on the end of the cable• One SAN Switch Rack Mount Kit hardware pouch:<ul style="list-style-type: none">• (10) #8-32 x 3/16-inch Phillips pan-head screws with thread lock for the SAN Switch 4/32 only• (14) #8-32 x 5/16-inch pan-head SEMS screws for use with the SAN Switch 2/8V, SAN Switch 2/16V and SAN Switch 2/16N• (10) #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers• (8) #10 alignment washers• (8) #10 adapter washers• (2) 1/4-20 hex nut with captive star lock washers• (2) 1/4-inch flat washers• Four Rubber feet for mounting on a flat surface, (i.e., a laboratory bench).• One HP StorageWorks SAN Switch Software CD, One set of HP StorageWorks product documentation including <i>HP StorageWorks SAN Switch 2/8V, 2/16V, 2/16N and 4/32 installation guide</i> (this guide), Safety Guides, User License and Warranty• For the SAN Switch 2/8V, one country-specific AC power cord, and one PDU power cord (not shown). For the SAN Switch 2/16V, 2/16N and 4/32, two AC power cords and two PDU power cords (not shown).
2	<p>SAN Switch Rack Mount Kit rail assemblies:</p> <ul style="list-style-type: none">• (2) rear mounting brackets• A right inner rail and a right outer rail• A left inner rail and a left outer rail
3	<p>One HP StorageWorks SAN Switch 2/8V, SAN Switch 2/16V, SAN Switch 2/16N or SAN Switch 4/32</p>

Installation and safety considerations

You can install the switch using one of the following methods:

- As a stand-alone unit on a flat surface. See [Installing as a stand-alone device](#), page 36.
- HP highly recommends mounting the switch in one of the following HP customized racks:
 - HP StorageWorks System/e Rack
 - HP StorageWorks 10,000 Series Rack

See [Installing the switch in a rack using the SAN Switch Rack Mount Kit](#), page 37 for detailed instructions.

Electrical considerations

For successful installation and operation of the switch, ensure that the following electrical requirements are met. For power supply information, refer to "[SAN Switch technical specifications](#)" on page 99.

- Primary AC input 100-240 VAC (switch auto-senses input voltage), 47-63 Hz.
- Correctly wired primary outlet, with circuit protected by a circuit breaker and grounded in accordance with local electrical codes.
- Adequate supply circuit, line fusing, and wire size, as specified by the electrical rating on the switch nameplate.

Environmental considerations

Verify that the following environmental considerations are met:

- At a minimum, adequate cooling requires that you install the switch with the non-port side, which contains the air intake vents, facing the cool-air aisle.
- Verify that a minimum of 24 cubic ft./minute of air flow is available to the air intake vents on the nonport side of the switch.
- Verify that the ambient air temperature does not exceed 40° C (104° F) while the switch is operating.

Rack specifications

If installing the switch in a rack:

- Plan a rack space that is 1 rack unit (1.75 inches; 4.45 cm) high, 19 inches (48.3 cm) wide, and at least 30 inches (76.2 cm) deep.
- The rack should be balanced and the installed equipment should be within the rack's weight limits. Ensure the rack is mechanically secured to insure stability in the event of an earthquake.
- Ground all equipment in rack through a reliable branch circuit connection and maintain ground at all times. Do not rely on a secondary connection to a branch circuit, such as a power strip.
- Ensure that airflow and temperature requirements are met on an ongoing basis, particularly if the switch is installed in a closed or multi-rack assembly.
- Verify that the additional weight of the switch does not exceed the rack's weight limits or unbalance the rack in any way.
- Secure the rack to ensure stability in case of unexpected movement, such as an earthquake.

Cooling considerations

Cooling air is drawn into the switch chassis by the fans mounted on the rear of the chassis. The air is expelled through vents in the front (port side) of the chassis. HP recommends installing the switch so that air intake and exhaust for all components in the rack are flowing in the same front-to-back direction.

Follow these guidelines to ensure proper air flow, and prevent component overheating:

- To ensure adequate cooling, install the switch with the non-port side, which contains the air intake vents, facing the cool-air aisle.
- Verify a minimum of 47 cubic feet/minute (79.8 cubic meters/hour) of air flow is available to the air intake vents on the non-port side of the switch.
- Verify that the ambient air temperature does not exceed 40° Celsius (104° Fahrenheit) while the switch is operating.



CAUTION: Do not block air vents. The switch uses ambient air for cooling.

Installing as a stand-alone device

Follow these steps to install as a stand-alone unit.

1. Unpack the switch and verify that all items listed on ["SAN Switch shipping carton contents"](#) on page 32 are present and undamaged.
2. Locate the four rubber feet in the Accessory box.
3. Apply the adhesive rubber feet. Applying the rubber feet in the switch helps prevent the switch from sliding off the supporting surface.
 - a. Clean the indentations at each corner of the bottom of the switch to ensure that they are free of dust or other debris that might lessen the adhesion of the feet.
 - b. With the adhesive side against the chassis, place one rubber foot in each indentation and press into place.
4. Place the switch on a flat, sturdy surface.
5. Apply power to the switch as described in ["Powering on and off"](#) on page 62.



CAUTION: Do not connect the switch to the network until the IP address is correctly set. For instructions on how to set the IP address, see ["Cabling and configuring the SAN Switch"](#) on page 50.

Installing the switch in a rack using the SAN Switch Rack Mount Kit

This section provides instructions for installing the SAN Switch in an HP System/e rack, or in an HP 10,000 series rack using the HP StorageWorks SAN Switch Rack Mount Kit supplied with your switch.

Install the SAN Switch Rack Mount Kit in one of two ways:

- Allow the port side of the switch to slide out of the exhaust-air side of the rack.
 - In this installation, the port side of the switch is flush with the edge of the rack.
- Allow the nonport side of the switch to slide out the cool-air side of the rack.
 - In this installation, the port side of the switch is set 3 in. (7.62 cm.) back from the edge of the rack, allowing a more gradual bend in the fiber optic cables.



NOTE: The SAN Switch Rack Mount Kit install requires one technician.

The following items are required to install the switch in a rack:

- SAN Switch
- Power cables
- #2 Phillips screwdriver
- 7/16-inch wrench or socket
- SAN Switch Rack Mount Kit hardware, illustrated in [Table 7](#)

Table 7 identifies SAN Switch Rack Mount Kit rails and rail mounting hardware.

Table 7 SAN Switch Rack Mount Kit hardware

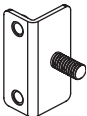


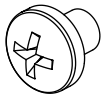


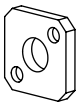


Item	Description
	(2) rear mounting brackets
	A right inner rail and a right outer rail
	A left inner rail and a left outer rail
	(10) #8-32 x 3/16-inch Phillips pan-head screws with thread lock, for use with the SAN Switch 4/32. (14) #8-32 x 5/16-inch Phillips pan-head SEMS screws for use with the SAN Switch 2/8V, SAN Switch 2/16V, SAN Switch 2/16N.
	(10) #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washer
	(8) #10 alignment washers

Table 7 SAN Switch Rack Mount Kit hardware (continued)

Item	Description
	(8) #10 adapter washers
	(2) 1/4-20 hex nuts with captive star lock washer
	(2) 1/4-inch flat washers



CAUTION: For proper air flow, the SFP media side of the SAN Switch must face the rear of the rack. This mounting allows air to enter from the front of the rack and to exhaust at the rear of the rack, similar to the other rack-mounted equipment.

To install the switch in a rack:

1. Check contents of the shipping carton to verify all the required parts and hardware are available.
2. Choose a mounting location in the rack for the switch.
3. Attach the rear mounting brackets to the rear rack uprights by completing one of the steps listed on page 40 or page 41.

- For an HP 10,000 series, assemble each of the two brackets with (2) #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers and (2) #10 adapter washers as shown in [Figure 7](#).

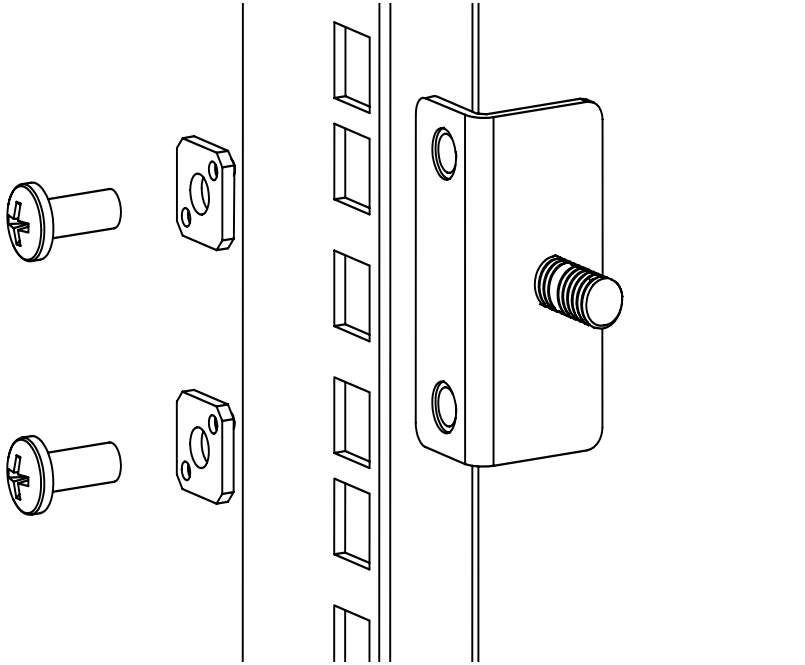


Figure 7 Installing the rear mounting brackets (HP 10,000 series)

- For an HP System/e rack, install each of the two rear mounting brackets with (2) #10-32 x 1/2-inch Phillips pan-head screws and (2) #10 alignment washers as shown in [Figure 8](#).

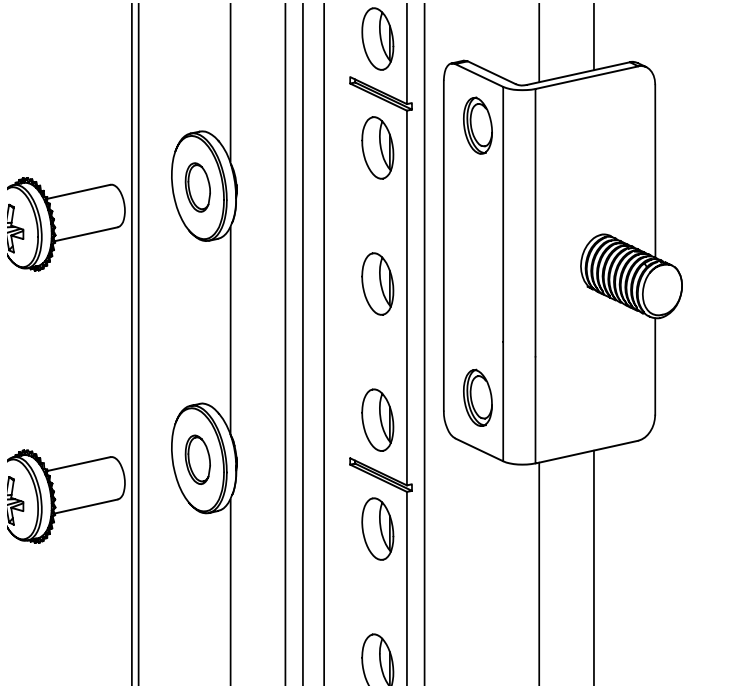


Figure 8 Installing the rear mounting brackets (HP System/e rack-left rear upright)



NOTE: This kit contains both left rails and right rails. The rails are marked *Right* and *Left*.

4. Assemble the outer rails by completing the appropriate step page 42 or page 43:
- Attach the left outer rail and the right outer rails to the rear mounting brackets using (2) 1/4-20 hex nuts with captive star lock washers attached loosely as shown in [Figure 9](#). Don't tighten them. The nuts will be tightened later in [step 12](#) on page 49.

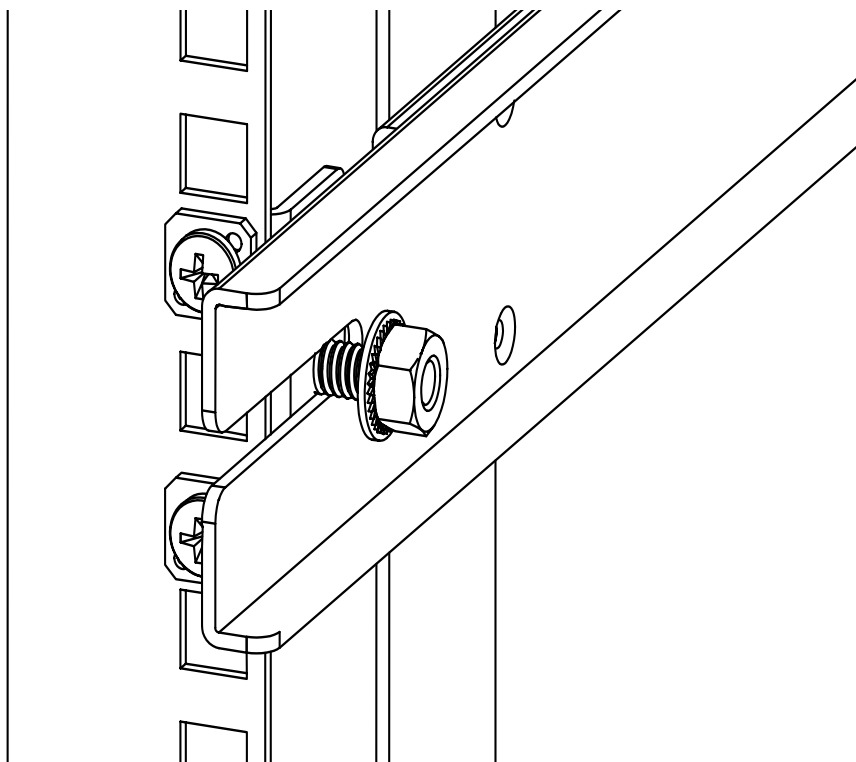


Figure 9 Installing the outer rails (HP 10,000 series)

- b.** Depending on the rack you are using, complete one of the following tasks:
- For an HP 10,000 series, install two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers and two #10 adapter washers in the upper and lower hole locations of the right rail. Then install two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers and two #10 adapter washers in the upper and lower hole locations of the left rail. See [Figure 10](#).

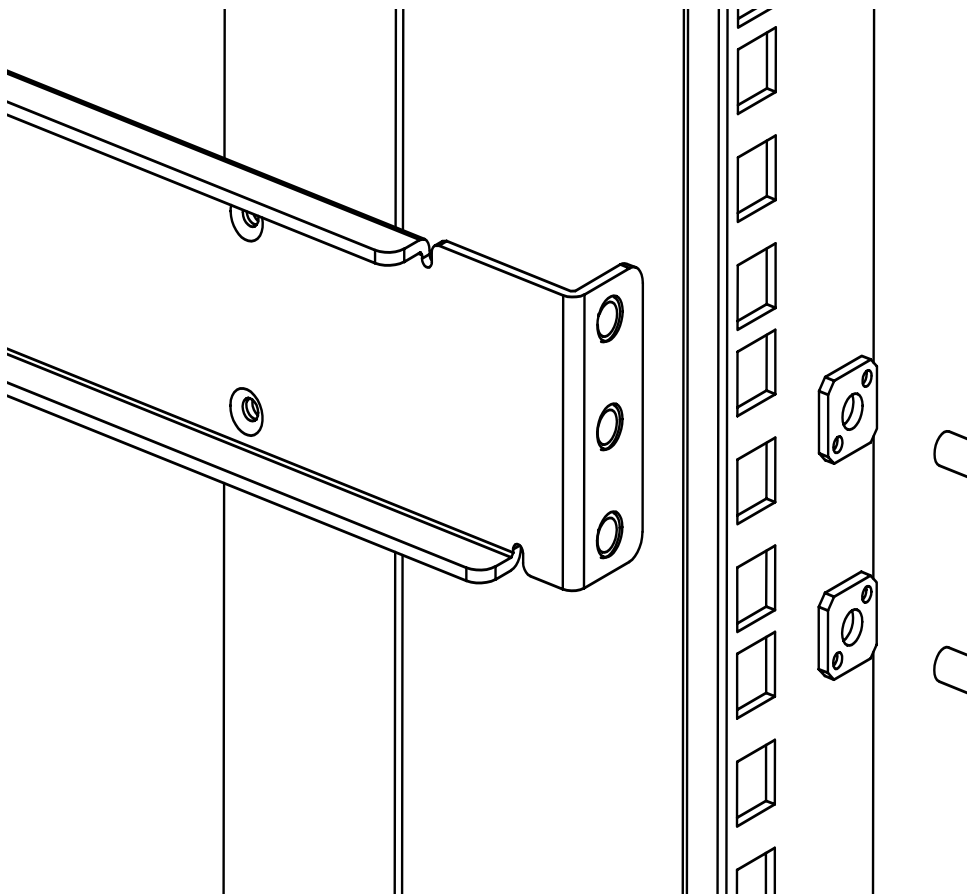


Figure 10 Assembling the outer rails (HP 10,000 series)

- For an HP System/e rack, install two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers and two #10 alignment washers in the upper and lower hole locations of the right rail. Then install two #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers and two #10 alignment washers in the upper and lower hole locations of the left rail. See [Figure 11](#).

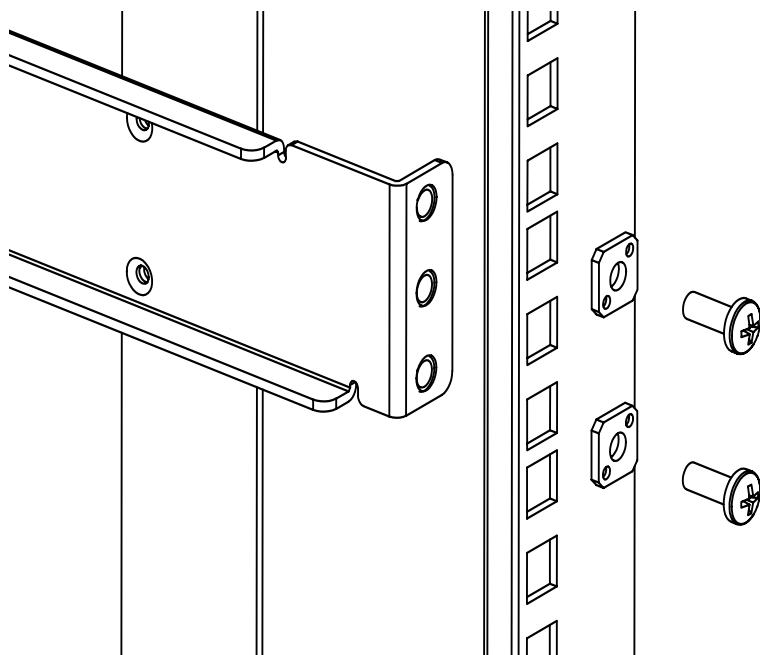


Figure 11 Assembling the outer rails (HP System/e rack)

5. The SAN Switch Rack Mount Kit provides different screw types for securing the inner rails. Specific switches require a different number of these screws. See [Table 8](#) to determine the appropriate number of screws.



CAUTION: Do not use any screws other than the ones provided. Use of any longer lengths can cause damage to internal components.

Table 8 Number of screws required to assemble the inner rails

Switch	#8-32 x 5/16-inch screws	#8-32 x 3/16-inch screws
SAN Switch 2/8V	10	Not Applicable
SAN Switch 2/16V, SAN Switch 2/16N	10	Not Applicable
SAN Switch 4/32	Not Applicable	10

6. Identify the screw holes on the inner rails for your specific switch. The screw holes are labelled as follows:
- To attach the inner rails to the SAN Switch 2/8V, SAN Switch 2/16V or SAN Switch 2/16N use the screw holes marked **8**.
 - To attach the inner rails to the SAN Switch 4/32 use the screw holes marked **16**.



NOTE: The mounting holes in the inner rails are marked 32, 16, and 8. For the SAN Switch 2/8V, SAN Switch 2/16V or SAN Switch 2/16N use the screw holes labelled **8**. For the SAN Switch 4/32, use the mounting holes labelled **16**.

7. Secure the two inner rails (one on each side) of the switch using the appropriate number of screws (refer to [Table 8](#)) as follows:
- For the SAN Switch 2/8V, secure each inner rail (one on each side) to the switch using five #8-32 x 5/16-inch Phillips pan-head SEMS screws as shown in [Figure 12](#).
 - For the SAN Switch 2/16V or 2/16N, secure each inner rail (one on each side) to the switch using five #8-32 x 5/16-inch Phillips pan-head SEMS screws, see [Figure 13](#).
 - For the SAN Switch 4/32, secure each inner rail (one on each side) to the switch using five #8-32 x 3/16-inch Phillips pan-head screws with thread lock as shown in [Figure 14](#).

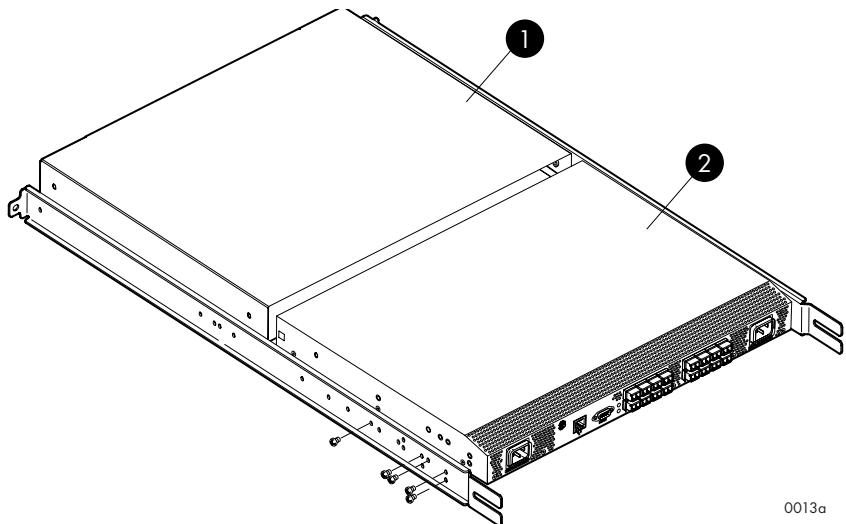


NOTE: For factory integration only, tighten the #8-32 x 5/16-inch Phillips pan-head SEMS screws and torque between 6 to 8 inch-pounds.

8. Verify that a plenum is installed on the SAN Switch 2/8V, SAN Switch 2/16V or SAN Switch 2/16N models only, as shown in [Figure 12](#). The plenum is an overlay that dissipates the heat generated by the switch, preventing overheating.



NOTE: The plenum is a required part of this installation for SAN Switch 2/8V, SAN Switch 2/16V or 2/16N models only, when installed in HP 10,000 series, or System/e racks.



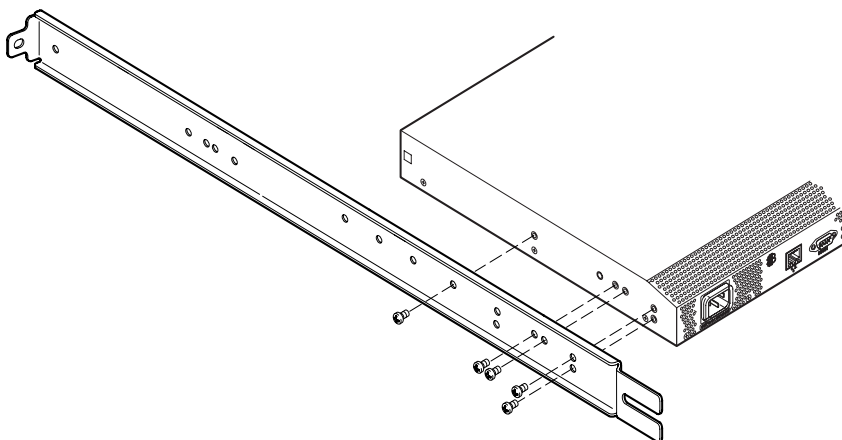
0013a

Figure 12 Securing the inner rails to the SAN Switch 2/8V with plenum

The components in [Table 12](#) include:

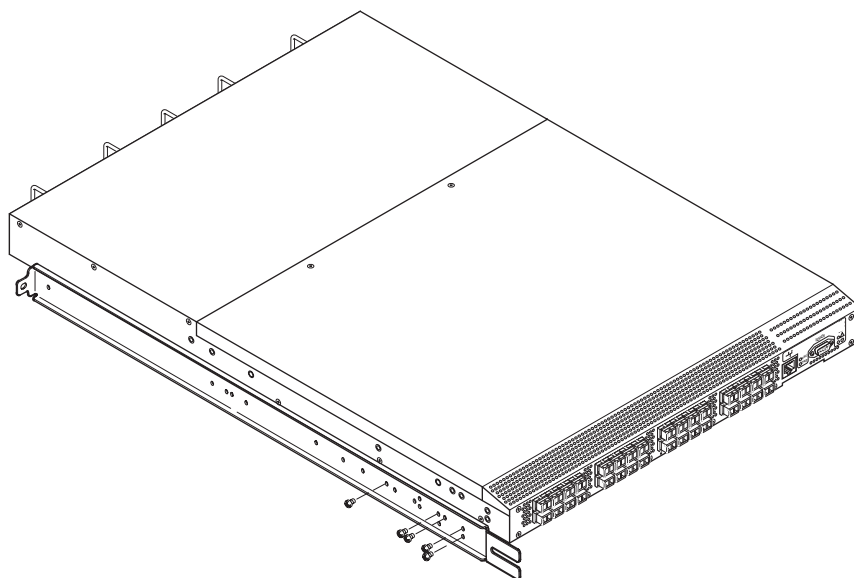
1	Plenum
2	Switch

9. Contact your authorized HP switch reseller for information if a plenum is not preinstalled on your SAN Switch 2/8V, SAN Switch 2/16V or SAN Switch 2/16N model only.



0012a

Figure 13 Securing the inner rails to the SAN Switch 2/16V



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Figure 14 Securing the inner rails to the SAN Switch 4/32

10. Insert the switch with the attached inner rails into the outer rails. Please note this step (#10), applies to both the HP 10,000 series and System/e racks.



NOTE: Note that the SAN Switch mounts in the rack with its front, the port side, facing the back of the rack. The rear of the switch, the AC side, faces the front of the rack.

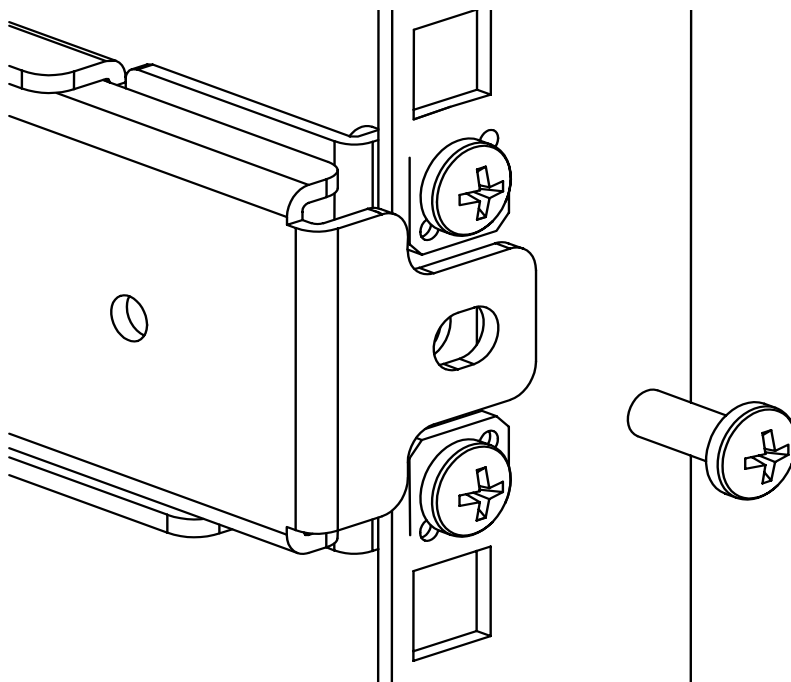


Figure 15 Installing the switch into a rack (HP 10,000 series rack)

11. Insert the switch into the rack and install (2) #10-32 x 1/2-inch Phillips pan-head screws with captive star lock washers with one on each side. See [Figure 15](#) and [Figure 16](#).

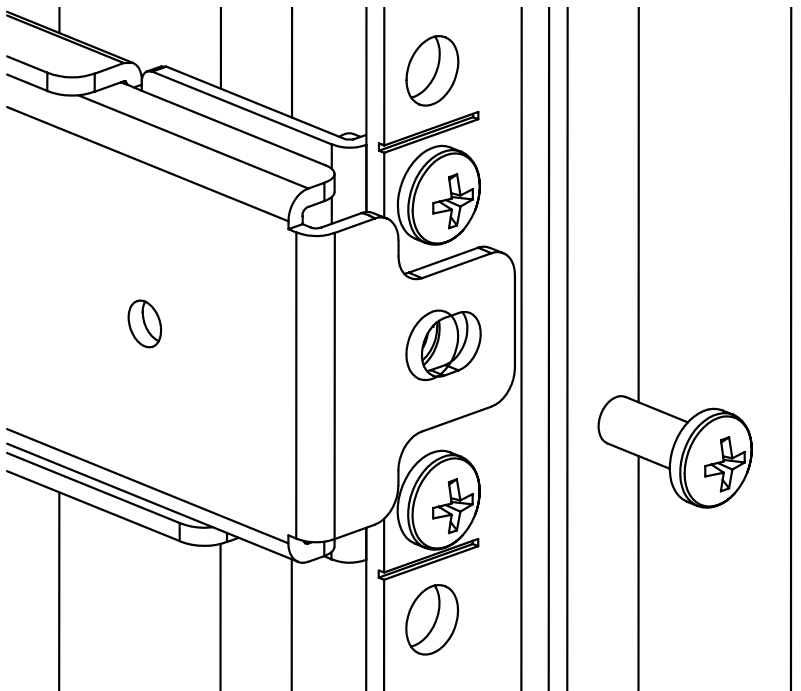


Figure 16 Installing the switch into a rack (HP System/e rack)

12. Tighten the nuts installed in [step 4](#) on page 42. See [Figure 9](#) on page 42.



NOTE: To uninstall a switch, remove the middle #10-32 x 1/2-inch Phillips pan head screw with captive star lock washer from either side of the rack uprights.

Cabling and configuring the SAN Switch

The SAN Switch must be configured to ensure correct operation within a network and fabric. For instructions about configuring the switch to operate in a fabric containing switches from other vendors, refer to the *HP StorageWorks procedures user guide* for the Fabric OS version running on your switch. For more information about the commands used in this procedure, refer to the *HP StorageWorks command reference guide* for the Fabric OS version running on your switch.



NOTE: All supporting Fabric OS documentation resides on the Software CD that shipped with your switch.

Recommendations for cable management

Following is a list of HP recommendations for cable management:

- Plan for rack space required for cable management before installing the switch.
- The minimum bend radius for a 50 micron cable is 2 inches under full tensile load and 1.2 inches with no tensile load.
- Leave at least 3.28 ft. (1 m.) of slack for each port cable. This provides room to remove and replace the switch, allows for inadvertent movement of the rack, and helps prevent the cables from being bent to less than the minimum bend radius.
- If you are using ISL Trunking, consider grouping cables by trunking groups. The cables used in trunking groups must meet specific requirements, as described in the *HP StorageWorks features overview*, located on the Software CD that shipped with your switch.
- For easier maintenance, label the fiber optic cables and record the devices to which they are connected.
- Keep LEDs visible by routing port cables and other cables away from the LEDs.
- Do not use tie wraps on fiber optic cables, because the wraps are easily overtightened and can damage the optic fibers. HP recommends using Filcrow wraps.

Connecting the SAN Switch to the fabric

Follow the sequence listed next. Procedures are included in the following sections:

1. [Making a serial connection](#), page 51
2. [Logging in](#), page 53
3. [Setting the IP address](#), page 54
4. [Creating an Ethernet connection](#), page 55
5. [Modifying the Fibre Channel domain ID \(Optional\)](#), page 56
6. [Installing the SFP transceivers](#), page 57
7. [Connecting the cables](#), page 57
8. [Verifying the configuration](#), page 58

Items required

Obtain the following items to configure the SAN Switch for use in a network:

- SAN Switch 2/8V, SAN Switch 2/16N, SAN Switch 2/16V or SAN Switch 4/32 installed and connected to a power source
- Workstation with an installed terminal emulator, such as HyperTerminal
- Unused IP address and corresponding subnet mask and gateway address
- Serial cable (supplied with switch)
- Ethernet cable
- SFP transceivers and compatible cables, as required
- Access to an FTP server for backing up the switch configuration

Making a serial connection

Use these steps to make a serial connection via the SAN Switch serial port.

1. Insert the serial cable into the serial port on the switch.
2. Connect the serial cable to an RS-232 serial port on the workstation as shown in [Figure 17](#).



NOTE: Figure 17 shows the SAN Switch 2/16V. This procedure is the same for all SAN Switches.

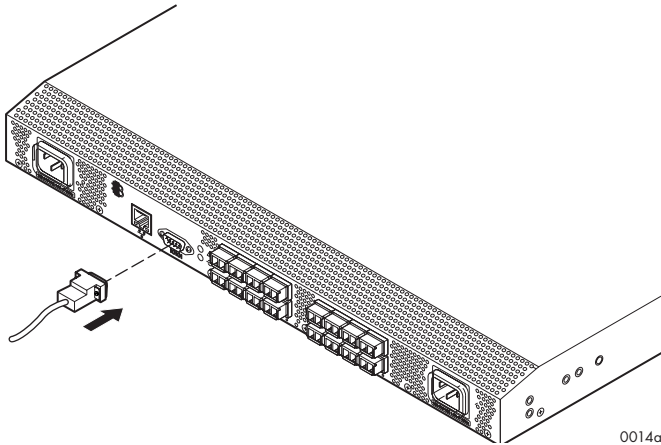


Figure 17 Connecting the serial cable to a SAN Switch 2/16V



NOTE: If the serial port on the workstation uses an RJ-45 connector instead of an RS-232, remove the adapter on the end of the serial cable and insert the exposed RJ-45 connector into the RJ-45 serial port on the workstation.

3. Disable any serial communication programs running on the workstation.
4. Open a terminal emulator application (such as HyperTerminal on a PC or TERM in a UNIX environment) and configure the application as follows:
 - In a Windows 95, 98, 2000, or NT environment:

Bits per second	9600
Databits	8
Parity	None
Stop bits	1
Flow control	None

- In a UNIX environment, type the following string at the prompt:

```
tip /dev/ttyb -9600
```

Logging in

Once a serial connection is established, apply power to the switch.

1. Connect the power cords to both power supplies and power sources, as shown in Figure 18.



NOTE: The SAN Switch 2/8V uses one power cord, all other SAN Switches use two.

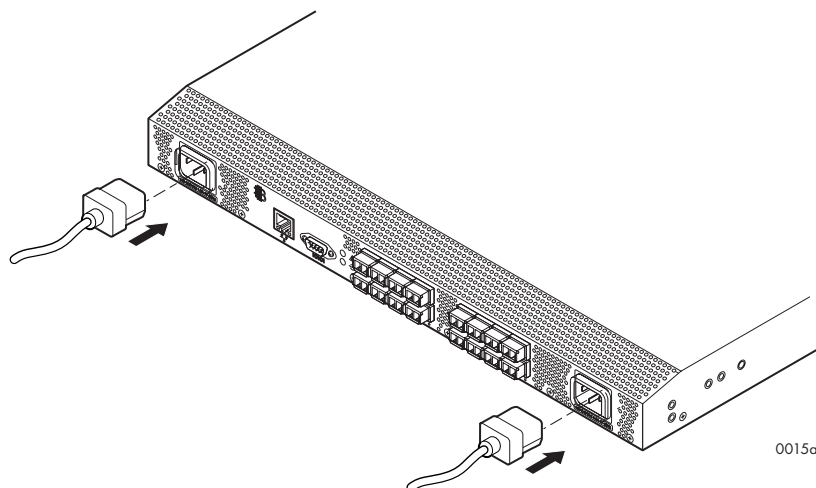


Figure 18 Connecting SAN Switch 2/16V power cords

NOTE: To protect against AC failure, connect the power cords to outlets on separate circuits. Verify that the cords have a minimum service loop of six inches available at the connection to the switch and are routed to avoid stress.

2. To power on, set the two AC switches to **1**.



NOTE: The SAN Switch 2/8V uses only one power switch.

3. The power supply LED lights up green, and the switch runs POST. The switch requires a minimum of three minutes to boot and complete POST.
4. After POST and the boot process completes, verify that the System Status and Power Status LEDs light green.

5. Using a serial connection, when the terminal emulator application stops reporting information, press **Enter** to display the login prompt.
6. Log in using the administrative account; the logon is "admin" and the default password is "password". Create up to two simultaneous admin sessions and four user sessions.

For specific details, refer to the specific *HP StorageWorks procedures user guide* and the *HP StorageWorks command reference guide* for the Fabric OS running on your switch. All supporting Fabric OS documentation resides on the Software CD that shipped with your switch.

Setting the IP address

Replace the default IP addressing information with the information provided by your network administrator. By default, the IP address is set to 10.77.77.77.

1. Type `ipaddrset` at the terminal emulator application prompt.
2. Type remaining IP addressing information, as prompted.
3. Optionally, verify that the address was correctly set by entering the `ipaddrshow` command at the prompt.
4. Record the IP address on the label clearly displayed on the port side of the chassis.

For the SAN Switch 4/32 only, record the IP address on the pull out tab provided for this purpose on the port side of switch.

5. If the serial port is no longer required, log out of the serial console, remove the serial cable, and replace the safety plug in the serial port.



NOTE: Notes provide important information to explain a concept or to complete a task

Creating an Ethernet connection

Use these steps to create an Ethernet connection.

1. Connect an Ethernet cable to the Ethernet port and to the workstation or to an Ethernet network containing the workstation as shown in [Figure 19](#).



NOTE: [Figure 19](#) shows the SAN Switch 2/16V. This procedure is the same for all SAN Switches.

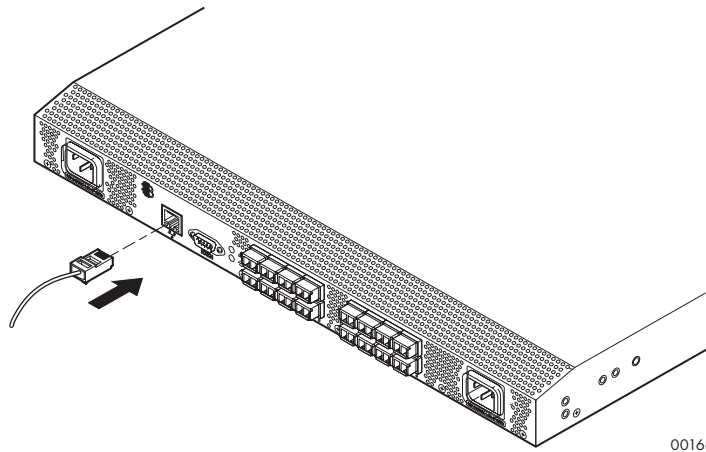


Figure 19 Connecting the Ethernet cable to the SAN Switch 2/16V

Once the Ethernet cable is connected, access the switch remotely, via the CLI or the built-in Advanced Web Tools GUI software.

2. Log in to the switch by telnet, using the `admin` account.

Modifying the Fibre Channel domain ID (Optional)

If desired, you can modify the Fibre Channel domain ID. The default Fibre channel domain ID is domain 1. If the switch is not powered on until after it is connected to the fabric and the default Fibre channel domain ID is already in use, the domain ID for the new switch is automatically reset to a unique value. If the switch is connected to the fabric after it has been powered on and the default domain ID is already in use, the fabric segments.

The domain IDs that are currently in use can be determined using the `fabricshow` command. The number of domains is determined by your domain fabric licensing. See ["SAN Switch licensing"](#) on page 25.

To modify the domain ID:

1. Type `switchdisable` to disable the switch.
2. Type **configure**. This prompts display sequentially; type a new value or press **Enter** to accept each default value.
3. At the Fabric Parameters prompt, type **Y** and press **Enter**:

```
Fabric parameters (yes, y, no, n): [no] y
```

4. Enter a unique domain ID, such as the domain ID used by the previous switch, if still available:

```
Domain: (1..239) [1] 3
```

5. Complete the remaining prompts or press **Ctrl+D** to accept the remaining default settings.
6. Enter the `switchenable` command to Re-enable the switch.
7. Optionally, specify any custom status policies:
 - a. Enter the `switchstatuspolicyset` command at the prompt. This command sets the policy parameters that determine the overall switch status.
 - b. Customize the status policies.

To deactivate the alarm for a particular condition, enter **0** at the prompt for that condition.

Installing the SFP transceivers

The SAN Switch does not ship with SFPs. A list of supported SFPs can be found in "[SAN Switch optional kits](#)" on page 28.

Use the following procedure to install the SFP transceivers into the Fibre Channel ports.

The ports selected for use in trunking groups must meet specific requirements. For a list of these requirements, refer to the specific "ISL Trunking" chapter in the *HP StorageWorks features overview* located on the Software CD that shipped with your switch.

Use these steps to install SFP transceivers.

1. Position a transceiver so that it is oriented correctly and insert it into a port until the latching mechanism clicks. The transceivers are keyed to ensure correct orientation. If a transceiver does not install easily, ensure that it is correctly oriented.

For instructions specific to the type of transceiver, refer to the transceiver manufacturer's documentation.

2. Repeat for the remaining ports, as required.

Connecting the cables

Use these steps connect the cables to the SFP transceivers.



CAUTION: The minimum bend radius for a 50-micron cable is 2 inches under full tensile load, and 1.2 inches with no tensile load.

Because they are easily overtightened, tie wraps are not recommended for optical cables.

-
1. The cable connectors are keyed to ensure correct orientation. Orient a cable connector so that the key (ridge on one side of connector) aligns with the slot in the transceiver and insert cable into transceiver until latching mechanism clicks. If a cable does not install easily, ensure it is correctly oriented. For instructions specific to cable type, refer to the cable manufacturer's documentation.
 2. Repeat for the remaining transceivers, as required.

Verifying the configuration

Use these steps to confirm that the switch is configured and ready for use.

1. Check LEDs to verify that all components are functional. For information about LED patterns, refer to ["Interpreting LED activity"](#) on page 64.
2. Enter the `switchshow` command from the workstation. This command provides information about the switch and port status.
3. Enter the `fabricshow` command from the workstation. This command provides general information about the fabric.

Backing up the configuration

HP recommends regular backups to ensure that a recent configuration is available.

Back up the switch configuration to an FTP server by entering the `configupload` command and following the prompts. This command uploads the switch configuration to the server, making it available for downloading to a replacement switch, if necessary.

Setting the switch date and time

The date and time switch settings are used for logging events. Switch operation does not depend on the date and time; a switch with an incorrect date and time value still functions properly.

You can synchronize the local time of the principal or primary Fabric Configuration Server (FCS) switch to that of an external Network Time Protocol (NTP) server.

Use these steps to set the date and time of a switch

1. Log in to the switch as `admin`.
2. Type the `date` command at the CLI prompt using the following syntax:

```
date "MMDDhhmm[CC]YY"
```

The values represent the following:

- MM is the month (01-12).
- DD is the date (01-31).
- hh is the hour (00-23).
- mm is minutes (00-59).
- CC is the century (19-20).
- YY is the year (00-99).

Year values greater than 69 are interpreted as 1970-1999; year values less than 70 are interpreted as 2000-2069. The date function does not support Daylight Savings Time or time zones, so changes will have to be reset manually.

Example

```
switch:admin> date
Fri May 5 21:50:00 UTC 1989
switch:admin>
switch:admin> date "0624165203"
Tue Jun 24 16:52:30 UTC 2003
switch:admin>
```

Synchronizing local time with an external source

Use this procedure to synchronize the local time of the principal or primary FCS switch with that of an external NTP server:

1. Log in as admin.
2. Enter the `tsClockServer [ipaddr]` command

The *ipaddr* variable represents the IP address of the NTP server that the switch can access. This argument is optional; by default, its value is "LOCL".

Example

```
switch:admin> tsclockserver
LOCL
switch:admin> tsclockserver 132.163.135.131
switch:admin>
```

Correcting the time zone of a switch

Use these steps set the time zone:

1. Log in as admin.
2. Enter the `tsTimeZone` command as follows:

`tsTimeZone [houroffset [, minuteoffset]]`

- For Pacific Standard Time, enter `tsTimeZone -8,0`
- For Central Standard Time, enter `tsTimeZone -6,0`
- For Eastern Standard Time, enter `tsTimeZone -5,0`

The default time zone for switches is Universal Time Conversion (UTC), which is eight hours ahead of Pacific Standard Time. The parameters listed do not apply if the time zone of the switch(es) has already been changed from the default (eight hours ahead of PT).

Refer to the `tsTimeZone` command in the *HP StorageWorks command reference guide* for more detailed information about the command parameters. All supporting Fabric OS documentation resides on the Software CD that shipped with your switch.

3. Repeat Steps 1 and 2 on all switches for which the time zone needs to be set.

This needs to be done only once, because the value is stored in nonvolatile memory.

For U.S. time zones, see [Table 9](#) to determine the correct parameter for the `tsTimeZone` command.

Table 9 `tsTimeZone` command parameter selection

Local Time	tsTimeZone parameter
Atlantic Standard	-4,0
Atlantic Daylight	-3,0
Eastern Standard	-5,0
Eastern Daylight	-4,0
Central Standard	-6,0
Central Daylight	-5,0
Mountain Standard	-7,0
Mountain Daylight	-6,0
Pacific Standard	-8,0
Pacific Daylight	-7,0
Alaskan Standard	-9,0
Alaskan Daylight	-8,0
Hawaiian Standard	-10,0

3 Managing SAN switches

Once your SAN Switch is installed and configured, you can monitor the health of the switch and fabric.

This chapter provides the following information:

- [Powering on and off](#), page 62
- [Management features](#), page 63
- [Interpreting LED activity](#), page 64
- [Managing SAN Switches from a single management station](#), page 64
- [SAN Switch 2/8V, 2/16V and 2/16N LEDs](#), page 65
- [SAN Switch 2/8V, 2/16V and 2/16N LED patterns](#), page 67
- [SAN Switch 4/32 LEDs—port side](#), page 70
- [SAN Switch 4/32 LEDs—nonport side](#), page 74
- [POST and boot specifications](#), page 76
- [Interpreting POST results](#), page 77
- [Diagnostic tests](#), page 77

Powering on and off

Read the following sections to power on and off SAN Switches.

SAN Switch 2/8V

Connect one end of the power cord to the AC inlet on the switch, and the remaining end to a power source.

To power on, set the AC power switch to **I**. The switch runs POST by default each time it is powered on, reset, or rebooted. POST requires approximately 3 minutes.

To power off, set the AC power switch to **●** and remove the power cord from the power source.



NOTE: Removing all power from the switch triggers a system reset. All devices are returned to their initial state the next time the switch is powered on.

SAN Switch 2/16V, 2/16N and 4/32

Connect one or both power cords to the AC power inlets on the nonport side of the switch, and the remaining end to a power source.

To power on, set both AC power switches to **I**. Power is supplied to the switch as soon as the first power supply is connected and powered on.

To power off, set the AC power switch to **●** and remove the AC power cord from the power source.



NOTE: Removing all power from the switch triggers a system reset. All devices are returned to their initial state the next time the switch is powered on.

Management features

SAN Switches use built-in management tools to help you monitor fabric topology, check port status, and debug the switch. [Table 10](#) lists the management applications available.



NOTE: When running IP over Fibre Channel, these management tools must be supported by both HBA and HBA drivers. For a list of supported HBAs, refer to the *HP StorageWorks SAN design guide*:
<http://h18000.www1.hp.com/products/storageworks/san/documentation.html>

Table 10 Management options

Management tool	Out-of-band support	In-band support
CLI Up to two admin sessions and four user sessions simultaneously.	Ethernet or serial connection	IP over Fibre Channel
Advanced Web Tools For information, refer to the <i>HP StorageWorks advanced web tools user guide</i> for the Fabric OS version running on your switch.	Ethernet connection	IP over Fibre Channel
Standard SNMP applications For information, refer to the <i>HP StorageWorks mib reference guide</i> for the Fabric OS version running on your switch.	Ethernet connection	IP over Fibre Channel
Management Server	Ethernet connection	Native in-band interface (over HBA only)

Managing SAN Switches from a single management station

A management station connected to one switch via Ethernet can also be used to manage other switches connected to the first switch via Fibre Channel. To do so, set the fibre channel gateway address of each of the other switches to be managed, to the Fibre Channel IP address of the first switch. The gateway address of the first switch should be set to what ever the gateway address is for the subnet that the first switch resides on.

For example:

	Management Station	First Switch	Second Switch	Third Switch
Ethernet	192.168.1.09	192.168.1.10	204.1.1.11	204.1.1.12
FCIP	192.168.65.09	192.168.65.10	192.168.65.11	192.168.65.12
Gateway	192.168.1.10	any not self	192.168.1.10	192.168.1.10

The disadvantage of this method is that the management station can only address the switches.

Interpreting LED activity

System activity and status can be determined through the activity of the LEDs on the switch. There are three possible LED states that display either green or amber:

- no light
- a steady light
- a flashing light

The LEDs flash during boot, POST, or other diagnostic tests. This is normal and does not indicate a problem. A healthy state is indicated by a steady green light.

SAN Switch 2/8V, 2/16V and 2/16N LEDs

The five LEDs include Switch Status, Power, Port Status, Port Speed and Ethernet.

Figure 20 shows the port side of the SAN Switch 2/8V. Figure 21 shows the port side of the SAN Switch 2/16V and 2/16N.

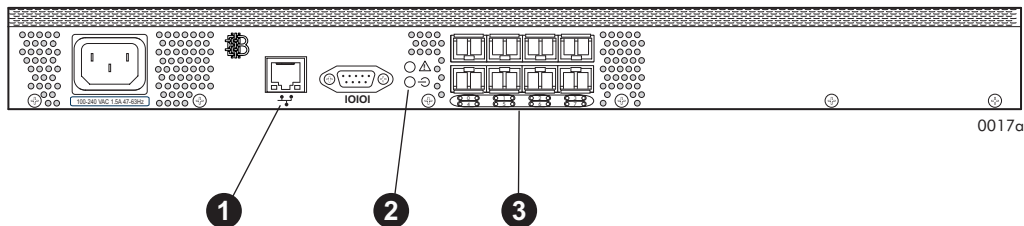


Figure 20 SAN Switch 2/8V LED locations

Table 11 identifies LED locations.

Table 11 SAN Switch 2/8V LED Locations

Component	Description
1	Ethernet LEDs
2	System and power LEDs
3	Port LEDs

All LEDs reside on the port side of the switch. [Figure 21](#) shows the location of SAN Switch 2/16V and 2/16N LEDs. See “[SAN Switch 2/8V, 2/16V and 2/16N LED patterns](#)” on page 67 for details about interpreting LEDs.

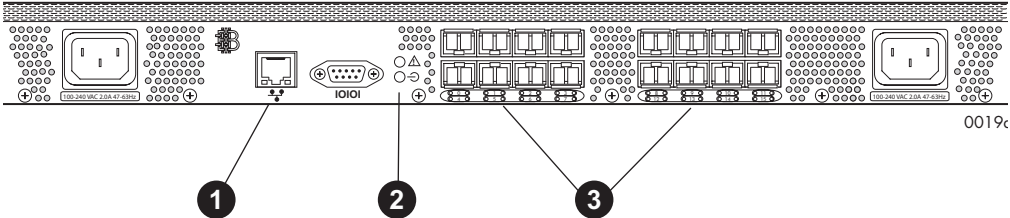


Figure 21 SAN Switch 2/16V and 2/16N LED locations

[Table 12](#) identifies the LEDs.

Table 12 SAN Switch 2/16V and 2/16N LED locations

Component	Description
1	Ethernet LEDs
2	System and power LEDs
3	Port LEDs

SAN Switch 2/8V, 2/16V and 2/16N LED patterns

Table 13, Table 14 and Table 15 summarize LED location, color, and recommended action.

System and power LED patterns

The system and power LED patterns are shown in Table 13.

Table 13 System LED patterns during normal operation

LED name, location	LED color	Status of hardware	Recommended action
System Status and Power Status At right of serial port on bottom	No light	Switch is off, boot is not complete, or boot failed.	Verify that switch is on and has completed booting.
	Steady green	Switch is on and power supplies are functioning properly.	No action required.
	Slow-flashing green (on 1 second, off 1 second)	One or both of the following are true: One or more environmental ranges are exceeded. Error log contains one or more port diagnostic error messages.	Check environmental conditions, error log, Port Status LEDs, transceivers, cables, and loopback plugs. Correct error condition. Clear error log. Rerun diagnostics to verify fix.
	Amber	One failed power supply in the SAN Switch 2/16V	No action required, but failure of the remaining power supply will cause the switch to fail.

Port LED patterns

Each port has two LEDs: a port speed and a port status indicator. [Table 14](#) shows the LED location, color, and meaning for these port LEDs.

Table 14 Port LED patterns during normal operation

LED name, location	LED color	Status of hardware	Recommended action
Port Status Below ports on left	No light	No light or signal carrier (transceiver or cable) detected.	Check transceiver and cable.
	Steady green	Port is online (connected to external device) but has no traffic.	No action required.
	Slow-flashing green (on 1 second, off 1 second)	Port is online but segmented, indicating a loopback cable or incompatible switch.	Verify that the correct device is connected to port and that the switch and port settings are correct.
	Fast-flashing green (on 1/4 second, off 1/4 second)	Port is in internal loopback (diagnostic).	No action required.
	Flickering green	Port is online with traffic flowing through port.	No action required.
	Steady amber	Port is receiving light or signal carrier, but is not yet online.	No action required.
	Slow-flashing amber (on 1 second, off 1 second)	Port is disabled as the result of diagnostics or <code>portDisable</code> command. If all ports are slow-flashing amber, the switch could be disabled.	Enable the port: use the <code>portEnable</code> command. If all ports are slow-flashing amber, enable the switch (<code>switchEnable</code> command).

Table 14 Port LED patterns during normal operation (continued)

LED name, location	LED color	Status of hardware	Recommended action
Port Status cont'd	Fast-flashing amber (on 1/4 second, off 1/4 second)	Port is faulty.	Check the Port Status LEDs, error log, transceiver, and cable or loopback plug. Clear the error log. Rerun the diagnostics to verify that the error condition is fixed.
	Alternating green and amber	Port is bypassed.	Check configuration of Fibre Channel loop.
Port Speed Below ports on right	No light	Port is transmitting/receiving at 1 Gb/sec.	No action required.
	Steady green	Port is transmitting/receiving at 2 Gb/sec.	No action required.

Ethernet LED patterns

Each Ethernet port has two LEDs, described in [Table 15](#).

Table 15 Ethernet LED patterns

LED name, location	LED color	Status of hardware	Recommended action
Ethernet speed Below port on right	No light	Port speed is 10 Mb/sec	No action required.
	Steady green	Port speed is 100 Mb/sec	
Ethernet link Below port on right	Amber	Link is valid traffic	No action required.
	Blinking green		

SAN Switch 4/32 LEDs—port side

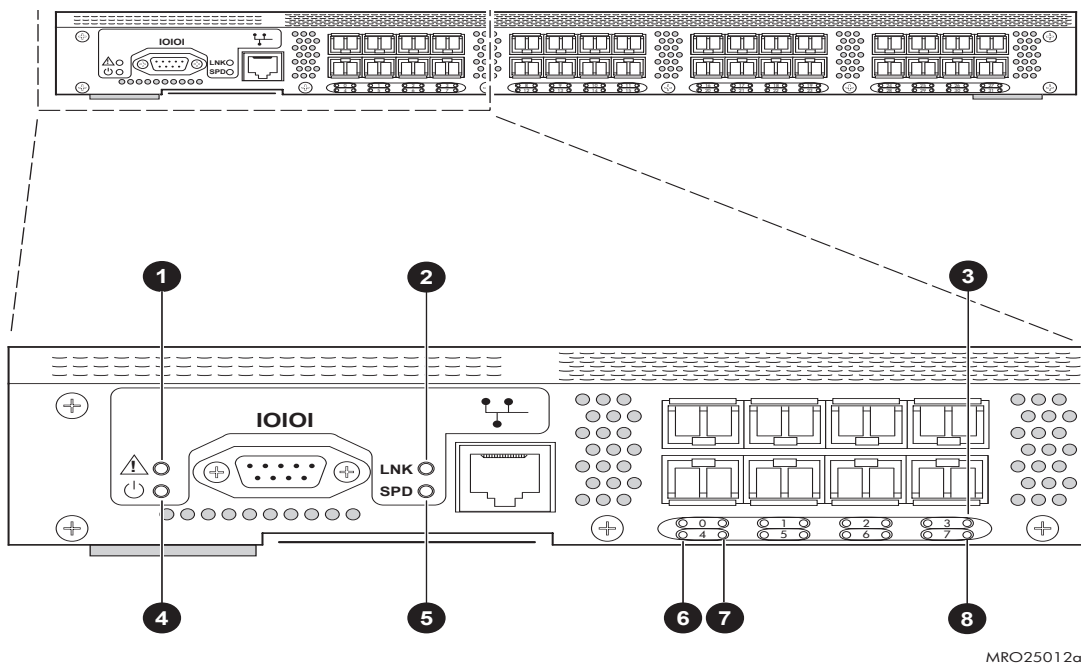
LEDs include:

- System Status LED
- Power Status LED
- Port Status LED
- Port Speed LED

Figure 22 identifies port side LEDs.



NOTE: The pairs of port LEDs for all 32 ports are arrayed below the bottom of row ports. The pairs of port LEDs are located in the array in the same relative positions as the ports.



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Figure 22 SAN Switch 4/32 port side LEDs

Table 16 identifies SAN Switch 4/32 nonport side components.

Table 16 SAN Switch 4/32 port side LEDs

Number	Description
1	System status LED
2	Link LED
3	Top port LEDs
4	Power status LED
5	Speed LED
6	Port status LEDs
7	Port speed LEDs
8	Bottom port LEDs

Table 17 describes port side LEDs.

Table 17 SAN Switch 4/32 port side LED patterns during normal operation

LED name	LED color	Status of hardware	Recommended action
Power Status	No light	System is off or there is an internal power supply failure.	Verify that system is on. If the system is on, the unit is faulty. Contact HP Technical Support.
	Steady green	System is on and power supplies are functioning properly.	No action required.
System Status	No light	System is off, boot is not complete, or boot failed.	Verify that system is on and has completed booting.
	Steady green	System is on and power supplies are functioning properly.	No action required.
	Steady amber (for more than five seconds)	Boot failed, the system is faulty.	Perform the following steps: <ol style="list-style-type: none"> 1. Connect a serial cable to the system. 2. Reboot the system. 3. Check the failure indicated on the system console. 4. Contact HP Technical Support.
	Flashing amber/green	Attention is required. A number of variables can cause this status including a single power supply failure, a fan failure, or one or more environmental ranges has exceeded.	Check the management interface and the error log for details on the cause of status. Contact HP Technical Support if required.
Ethernet Speed	No light	Port speed is 10 Mb/sec.	No action required.
	Steady green	Port speed is 100 Mb/sec.	No action required.
Ethernet Link	No light	There is no link.	Verify that the Ethernet cable is connected correctly.
	Steady amber	There is a link.	No action required.
	Flashing amber/no light	There is link activity (traffic).	No action required.

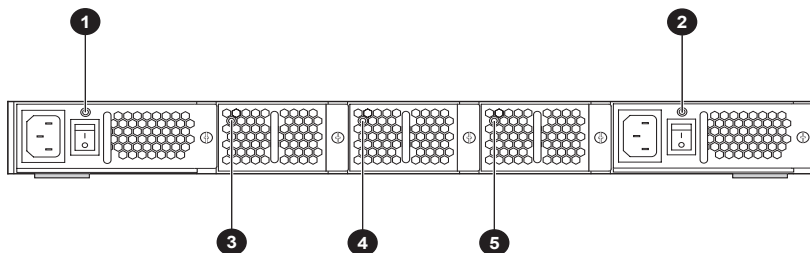
Table 17 SAN Switch 4/32 port side LED patterns during normal operation (continued)

LED name	LED color	Status of hardware	Recommended action
Port Speed	No light	Port is transmitting/receiving at 1 Gbit/sec.	No action required.
	Steady green	Port is transmitting/receiving at 2 Gbit/sec.	No action required.
	Steady amber	Port is transmitting/receiving at 4 Gbit/sec.	No action required.
Port Status	No light	No signal or light carrier (media or cable) detected.	Check transceiver and cable.
	Slow flashing green (flashing in two-second intervals)	Port is online but segmented because of a loopback cable or incompatible switch connection.	No action required.
	Fast flashing green (flashing in half-second intervals)	Port is online and an internal loopback diagnostic test is running.	No action required.
	Flickering green (steady with random flashes)	Port is online and frames are flowing through the port.	No action required.
	Steady green	Port is online (connected to external device) but has no traffic.	No action required.
	Slow flashing amber (flashing in two-second intervals)	Port is disabled (because of diagnostics or the <code>portDisable</code> command).	Verify that the diagnostic tests are not running. Reenable the port using the <code>portEnable</code> command.
	Fast flashing amber (flashing in half-second intervals)	Port is faulty.	Check the management interface and the error log for details on the cause of status. Contact HP Technical Support. i
	Steady amber (for more than five seconds)	Port is receiving light or signal carrier at 4 Gbit/sec; but is not yet online.	No action required.

SAN Switch 4/32 LEDs—nonport side

LEDs include:

- Two power supply LEDs
- Three fan status LEDs



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Figure 23 SAN Switch 4/32 nonport side LEDs

Table 18 identifies SAN Switch 4/32 nonport side LEDs.

Table 18 SAN Switch 4/32 nonport side LEDs

Number	Description
1	Power supply 2 status LED
2	Power supply 1 status LED
3	Fan 3 status LED
4	Fan 2 status LED
5	Fan 1 status LED

Table 19 describes the nonport side LEDs.

Table 19 Nonport side LED patterns during normal operation

LED name	LED color	Status of hardware	Recommended action
Power Supply Status	No light	Power supply is not receiving power or is off.	Verify that the power supply is on and seated and the power cord is connected to a functioning power source.
	Steady green	Power supply is operating normally.	No action required.
	Steady amber (for more than five seconds)	Power supply fault for one of the following reasons: <ul style="list-style-type: none"> power cable is disconnected power supply is off the power supply has failed 	Try the following: <ul style="list-style-type: none"> check the power cable connection verify that the power supply is powered on replace the power supply
Fan Status	No light	Fan assembly is not receiving power.	No action required.
	Steady green	Fan assembly is operating normally.	No action required.
	Steady amber (for more than five seconds)	Fan fault for one of the following reasons: <ul style="list-style-type: none"> one or more of the fan(s) in the fan assembly has failed the fan FRU was disabled by the user 	Verify that the fan FRU is enabled. If the fan FRU is enabled, the FRU is faulty and should be replaced.

POST and boot specifications

When the switch is turned on or rebooted, the switch performs POST. Total boot time with POST is a minimum of 3 minutes.

Use `fastboot` to bypass POST after subsequent reboots by For more information about this command, refer to the *HP StorageWorks command reference guide* for the Fabric OS version running on your switch.

POST

The success/failure results of the diagnostic tests that run during POST can be monitored through the error log or the CLI.

POST includes the following:

- Preliminary POST diagnostics display.
- Operating system is initializes.
- Hardware initializes.
- Diagnostic tests check several functions, including circuitry, port functionality, memory, statistics counters, and serialization.

Boot

Boot completes in approximately 3 minutes with POST running. In addition to POST, boot includes the following after POST completes:

- Universal port configuration set
- Links initialize
- Fabric is analyzed, and if any ports are connected to other switches, the switch participates in a fabric configuration.
- Switch obtains a domain ID and assigns port addresses
- Unicast routing tables constructed
- Normal port operation enabled

Interpreting POST results

POST is a system check that is performed each time the switch is powered on, rebooted, or reset. During POST, the LEDs flash different colors. Any errors that occur during POST display in the error log.

To determine that POST completed successfully and whether or not any errors were detected:

1. Verify that the switch LEDs indicate that all components are healthy. If one or more LEDs do not display a healthy state, verify that the LEDs on the switch are not set to “beacon” using the `switchshow` command.
2. Verify the switch prompt displays on the terminal of a computer workstation connected to the switch. If there is no switch prompt when POST completes, press **Enter**. If the switch prompt still does not display, try opening another telnet session or accessing through another management tool. If this is not successful, the switch did not successfully complete POST; contact your HP Technical Support.
3. Review the switch system log for errors. Any errors detected during POST are written to the system log, accessible through the `errshow` command.

For information about all referenced commands, and on accessing the error log, refer to the *HP StorageWorks procedures user guide* and the *HP StorageWorks diagnostics and system error messages reference guide* for the Fabric OS version running on your switch.

All supporting Fabric OS documentation resides on the Software CD that shipped with your switch.

Diagnostic tests

In addition to POST, Fabric OS includes diagnostic tests to help troubleshoot the hardware and the firmware. This includes tests of internal connections and circuitry, fixed media, and the transceivers and cables in use.

The tests are implemented by command, either through a telnet session or through a terminal set up for a serial connection to the switch. Some tests require the ports to be connected by external cables, to allow diagnostics to verify the serializer/deserializer interface, transceiver, and cable.

All diagnostic tests are run at link speeds of both 1 Gb/sec and 2 Gb/sec.



CAUTION: Diagnostic tests can temporarily lock the transmit and receive speed of the links during diagnostic testing.

4 Installing field-replaceable units

The SAN Switch 2/8V, SAN Switch 2/16V and SAN Switch 2/16N *do not* require any regular maintenance, and do not contain any Field-Replaceable Units (FRUs). In contrast, the SAN Switch 4/32 contains two FRUs; the power supply and fan assembly.

This chapter provides the following information for the SAN Switch 4/32 *only*:

- [Replacing the SAN Switch 4/32 power supply](#), page 80
- [Replacing the fan assembly in the SAN Switch 4/32](#), page 85

This chapter provides the following information for all SAN Switches:

- [Replacing SFPs](#), page 89

Replacing the SAN Switch 4/32 power supply

The SAN Switch 4/32 uses two power supplies, as shown in [Figure 24](#). The Fabric OS identifies the power supplies from left to right on the nonport side as PS2 (on the left) and PS1 (on the right).

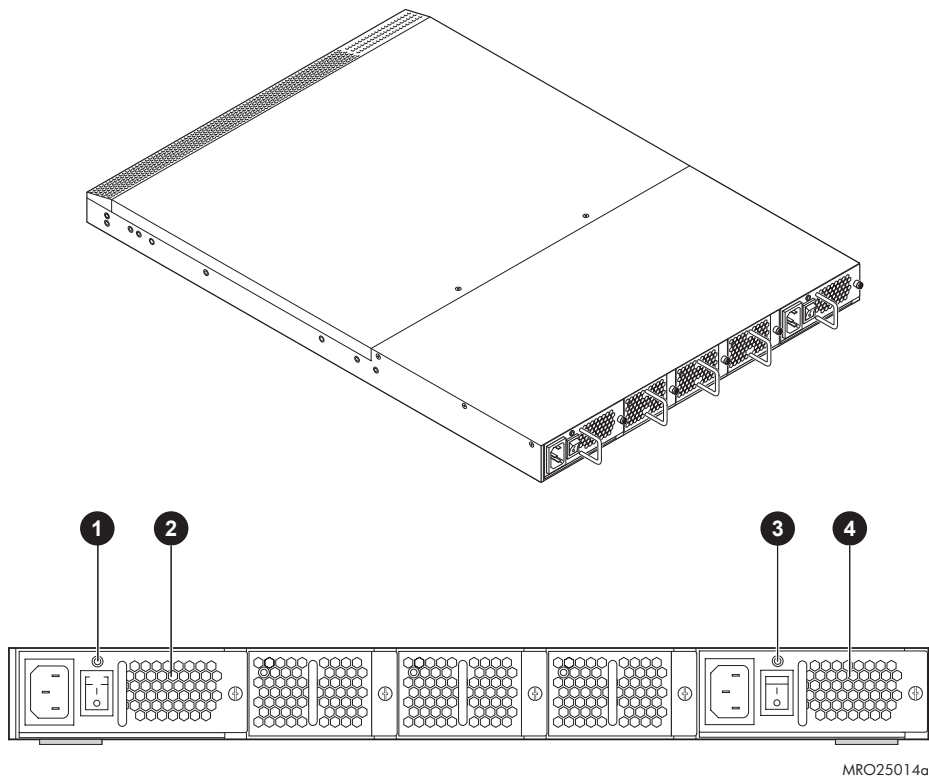


Figure 24 SAN Switch 4/32 power supplies on the nonport side

[Table 20](#) lists the SAN Switch 4/32 nonport side LEDs.

Table 20 SAN Switch 4/32 nonport side LEDs

Number	Description
1	Power supply 2 status LED
2	Power supply 2

Table 20 SAN Switch 4/32 nonport side LEDs (continued)

Number	Description
3	Power supply 1 status LED
4	Power supply 1



CAUTION: Disassembling any part of the power supply voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the power supply.

Table 21 describes the power supply status LEDs and corrective actions.

Table 21 Power supply status LEDs

LED behavior	Meaning	Correction action
No light	The power supply is not receiving power or is off.	Verify that the power supply is on and seated and that the power cord is connected to a functioning power source.
Steady green	Power supply is operating normally.	No action required.
Steady amber for more than five seconds	Power supply fault for one of the following reasons: <ul style="list-style-type: none"> • Power cable is disconnected • Power supply is off • Power supply has failed 	Try the following: <ul style="list-style-type: none"> • Check the power cable connection. • Verify that the power supply is powered on. • Replace the power supply.


Items required

Replacing a power supply in the SAN Switch 4/32 should take less than two minutes. Obtain the following items:

- New power supply
- Phillips-head screwdriver #1

Procedure

Use these steps to replace a power supply in a SAN Switch 4/32.

1. If the switch will remain powered on, verify that the functioning power supply (the one not being replaced) has been powered on for at least four seconds and displays a green LED.
2. If the power supply you are replacing is not already powered off, press the AC power switch to the circle symbol  to power it off. [Figure 25](#) shows the location of the AC power switch.
3. Unplug the power cord from the power supply that you are replacing.
4. Unscrew the captive screw on the power supply that you are replacing, using the Phillips-head screwdriver.
5. Remove the power supply from the chassis by pulling its handle out, away from the chassis.
6. Install the new power supply in the chassis:
 - a. Orient the power supply as shown in [Figure 25](#), with the AC power receptacle on the left. See [Table 22](#) for power supply components.

- b. Gently push the power supply into the chassis until it is firmly seated.

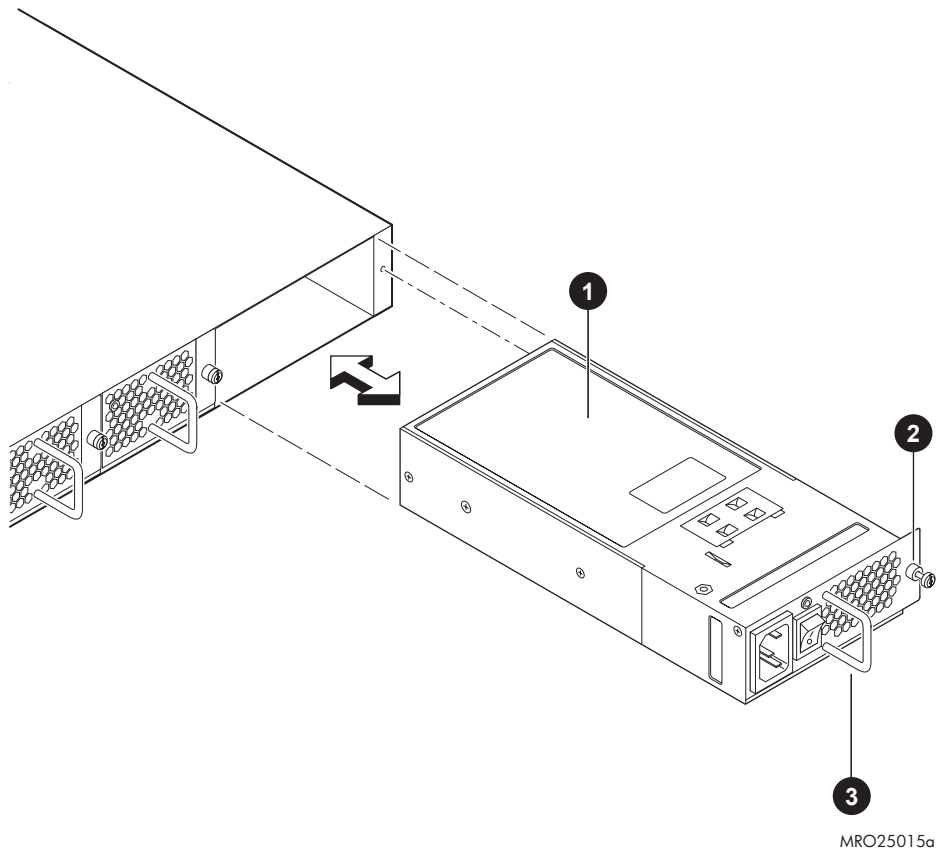


Figure 25 Inserting the power supply in the SAN Switch 4/32

Table 22 identifies power supply components.

Table 22 Power supply components

Number	Description
1	Power supply
2	Captive screw
3	Handle



CAUTION: Do not force the installation. If the power supply does not slide in easily, make sure that it is correctly oriented before continuing.

- c. Secure the power supply to the chassis by tightening the captive screw using the Phillips-head screwdriver.
7. Plug the power cord into the power supply and press the AC power switch to turn it on.
8. Verify that the LED on the new power supply displays a steady green light while the switch is operating (see [Table 21](#)). If the LED is not green, ensure that the power supply is firmly installed.
9. Optional step: issue the `psShow` command at the CLI prompt to display power supply status. Fabric OS identifies the power supplies in a SAN Switch 4/32 from left to right as PS2 and PS1, as shown in [Figure 25](#).

Replacing the fan assembly in the SAN Switch 4/32

The SAN Switch 4/32 integrates three fan assemblies as shown in [Figure 26](#). Fabric OS identifies the fans from left to right as Fan 3, Fan 2, and Fan 1.

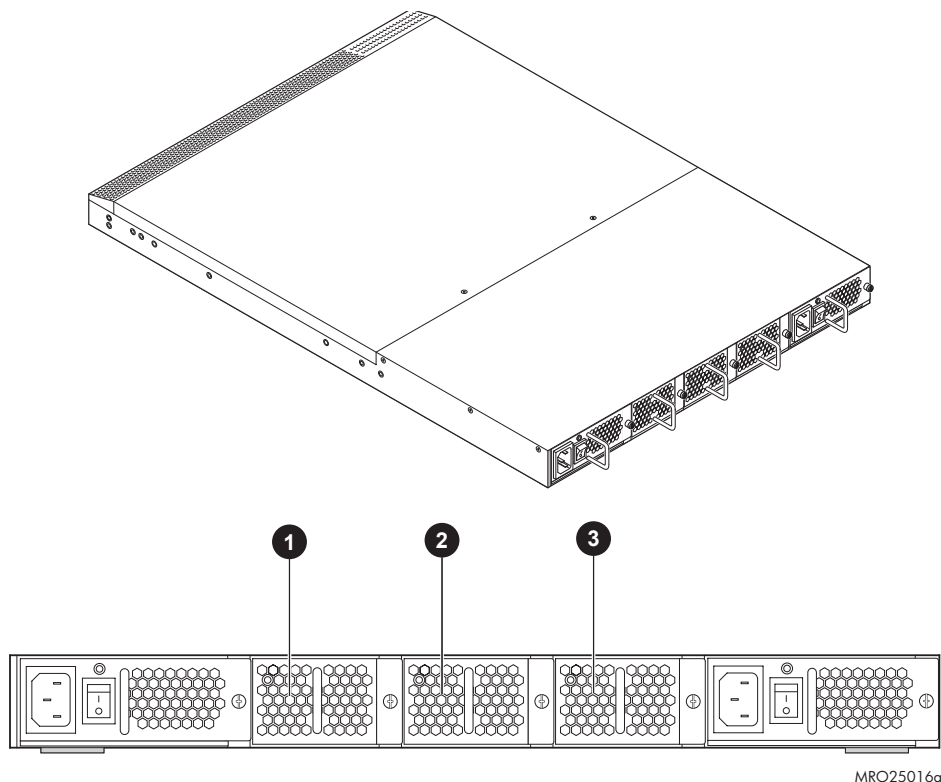


Figure 26 SAN Switch 4/32 fan assemblies on the nonport side

[Table 23](#) identifies fan assembly locations.

Table 23 Fan assemblies

Number	Description
1	Fan 3
2	Fan 2
3	Fan 1



CAUTION: Disassembling any part of the fan assembly voids the part warranty and regulatory certifications. There are no user-serviceable parts inside the fan assembly.

Because the cooling system relies on pressurized air, do not leave any of the fan assembly slots empty longer than two minutes while the switch is operating. If a fan assembly fails, leave it installed in the switch until it can be replaced.

Maintain all three fan assemblies in operational condition to provide redundancy.

Table 24 describes the fan status LED meanings, and corrective actions.

Table 24 Fan status LED behavior

LED Behavior	Meaning	Corrective action
No light	Fan assembly is not receiving power.	No action required.
Steady green	Fan assembly is operating normally.	No action required.
Steady amber for more than five seconds	Fan fault for one of the following reasons: <ul style="list-style-type: none">• One or more of the fans in the fan assembly has failed.• The fan FRU was disabled by the user.	Verify that the fan FRU is enabled. If the fan FRU is enabled, the FRU is faulty and should be replaced.

Items required

Replacing a fan assembly in the SAN Switch 4/32 takes approximately two minutes. Obtain the following items:

- New fan assembly
- Phillips-head screwdriver #1

Procedure

Use these steps to replace a fan assembly in a SAN Switch 4/32.

1. Unscrew the captive screw on the fan assembly you are replacing using the Phillips-head screwdriver.
2. Remove the fan assembly from the chassis by pulling the handle out, away from the chassis.
3. Install the new fan assembly in the chassis:
 - a. Orient the new fan assembly as shown in [Figure 27](#), with the captive screw on the right.
 - b. Gently push the fan assembly into the chassis until it is firmly seated.

- c. Secure the fan assembly to the chassis by tightening the captive screw.

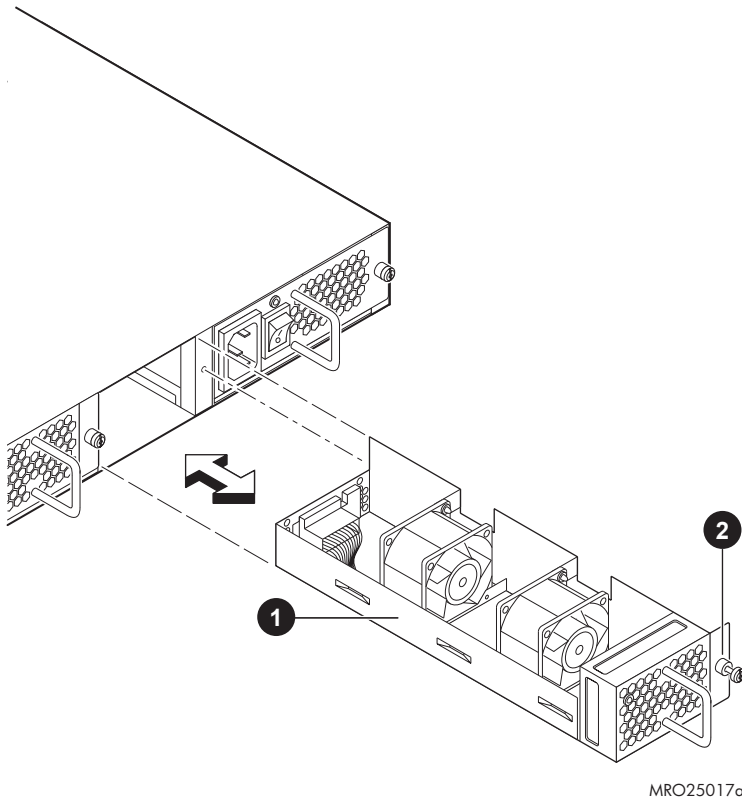


Figure 27 Inserting the fan assembly

Table 25 identifies fan assembly components in Figure 27.

Table 25 Fan assemblies

Number	Description
1	Fan assembly
2	Captive screw



CAUTION: Do not force the installation. If the fan assembly does not slide in easily, ensure that it is correctly oriented before continuing.

4. Verify that the fan status LED does not show a steady amber color for more than five seconds, which indicates a fault (see Table 24 on page 86).

Replacing SFPs

First, use these steps to remove the faulty SFP transceiver.

1. Press and hold the cable release, as shown in [Figure 28](#) on page 90.
2. Remove the cable from the transceiver.
3. Pull the bale (wire handle) to release the transceiver.
4. Grasping it by the bale, gently but firmly pull the transceiver out of the port.



CAUTION: If the SFP you are removing does not have a bale, use a small implement such as a screwdriver to press the release trigger beneath the port. Non-baled SFPs can be damaged by the removal process and are not recommended. See "[SAN Switch optional kits](#)" on page 28 for a list of supported SFPs.

5. Repeat this procedure for the remaining ports as required.

Use these steps to install a replacement SFP.

1. Making sure that the bale (wire handle) is in the unlocked position, and place the SFP in the correctly oriented position on the port, as shown in [Figure 28](#) on page 90.
2. Slide the SFP into the port until you feel it click into place and close the bale.

Figure 28 shows the SFP installation and removal steps for a SAN Switch 2/16V.

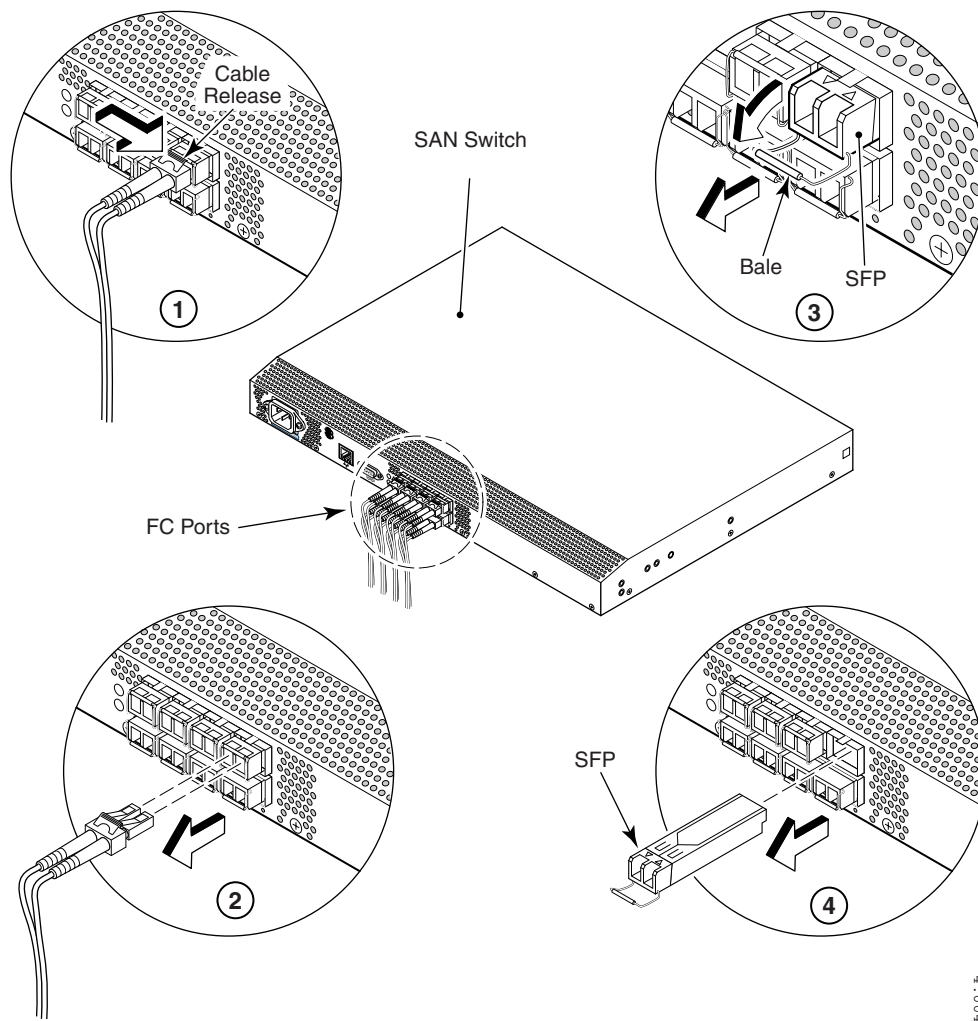


Figure 28 Installing or removing an SFP

A Regulatory compliance notices

This appendix covers the following topics:

- [FCC EMC statement \(USA\)](#), page 91
- [EMC statement \(Canada\)](#), page 92
- [EMC statement \(European Union\)](#), page 92
- [European union notice](#), page 92
- [Germany noise declaration](#), page 92
- [VCCI EMC statement \(Japan\)](#), page 93
- [Japanese power cord statement](#), page 93
- [RRL EMC statement \(Korea\)](#), page 94
- [Laser safety](#), page 95
- [Battery replacement notice](#), page 96

FCC EMC statement (USA)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense. The end user of this product should be aware that any changes or modifications made to this equipment without the approval of Hewlett-Packard could result in the product not meeting the Class A limits, in which case the FCC could void the user's authority to operate the equipment.

The Regulatory Series Number for the SAN Switch 2/8V, SAN Switch 2/16V and SAN Switch 2/16N is HSTNM-N001.

The Regulatory Series Number for the SAN Switch 4/32 is HSTNM-N003.

EMC statement (Canada)

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

EMC statement (European Union)

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

European union notice

Products bearing the CE marking comply with the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community and if this product has telecommunication functionality, the R&TTE Directive (1999/5/EC).

Compliance with these directives implies conformity to the following European Norms (in parentheses are the equivalent international standards and regulations):

- EN 55022 (CISPR 22)—Electromagnetic Interference
- EN55024 (IEC61000-4-2, 3, 4, 5, 6, 8, 11)—Electromagnetic Immunity
- EN61000-3-2 (IEC61000-3-2)—Power Line Harmonics
- EN61000-3-3 (IEC61000-3-3)—Power Line Flicker
- EN 60950 (IEC 60950)—Product Safety

Germany noise declaration

Schalldruckpegel L_p = 46.1 dB(A) Am Arbeitsplatz (operator position) Normaler Betrieb (normal operation) Nach ISO 7779:1999 (Typprüfung)

VCCI EMC statement (Japan)

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Japanese power cord statement

製品には、同梱された電源コードをお使い下さい。
同梱された電源コードは、他の製品では使用出来ません。

RRL EMC statement (Korea)

KOREAN NOTICE

A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니
판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약
잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기
바랍니다.

브로케이드 커뮤니케이션 시스템

Laser safety

A. Certification and Classification Information

When equipped with native Fibre Channel adapters, this product contains a laser internal to the small form factor pluggable (SFP) transceiver modules.

In the USA, the SFP module is certified as a Class 1 Laser product, conforming to the requirements contained in Department Of Health and Human Services (DHHS) regulation 21 CFR, Subchapter J. The certification is indicated by a label on the metal SFP housing.

Outside the USA, the SFP is certified as a Class 1 Laser product conforming to requirements contained in IEC 825-1:1993 and EN60825-1:1994, including Amendment 11:1996.

The SFP includes the following certifications:

- UL Recognized Component (USA)
- CSA Certified Component (Canada)
- TUV Certified Component (European Union)
- CB Certificate (Worldwide)

The following figure shows the Class 1 information label that appears on the metal housing of the SFP.

CLASS 1 LASER PRODUCT 21 CFR(J)

B. Product Information

Each communications port consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains internally a semiconductor laser diode in the wavelength of either 850 nanometers (shortwave laser) or 1310 nanometers (longwave laser).

Class 1 Laser products are not considered hazardous.

C. Usage Restrictions

Failure to comply with these usage restrictions may result in incorrect operation of the system and points of access may emit laser radiation above the Class 1 limits established by the IEC and U.S. DHHS.



WARNING! Use of controls or adjustments or performance of procedures other than those specified herein or in the laser product's installation guide may result in hazardous radiation exposure. To reduce the risk of exposure to hazardous radiation: Do not try to open the module enclosure. There are no user-serviceable components inside. Do not operate controls, make adjustments, or perform procedures to the laser device other than those specified herein. Allow only HP Authorized Service technicians to repair the unit.

Battery replacement notice

Your switch is equipped with a lithium manganese dioxide, a vanadium pentoxide, or an alkaline internal battery or battery pack. There is a danger of explosion and risk of personal injury if the battery is incorrectly replaced or mistreated. Replacement is to be done by an HP authorized service provider using the HP spare designated for this product. For more information about battery replacement or proper disposal, contact your HP authorized reseller or your authorized service provider.



WARNING! Your switch contains an internal lithium manganese dioxide, a vanadium pentoxide, or an alkaline battery. There is risk of fire and burns if the battery is not handled properly. To reduce the risk of personal injury:

- Do not attempt to recharge the battery.
- Do not expose to temperatures higher than 140°F (60°C).
- Do not disassemble, crush, puncture, short external contacts, or dispose of in fire or water.

Batteries, battery packs, and accumulators should not be disposed of with the general household waste. Please use the public collection system for recycling or proper disposal or return them to HP, your authorized HP partners, or their agents.

B Electrostatic discharge

To prevent damaging the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

To prevent electrostatic damage, observe the following precautions:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always make sure you are properly grounded when touching a static-sensitive component or assembly.

Grounding methods

There are several methods for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or chassis. Wrist straps are flexible straps with a minimum of 1 megohm \pm 10 percent resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, have an HP authorized reseller install the part.



NOTE: For more information on static electricity, or for assistance with product installation, contact your HP authorized reseller.

C SAN Switch technical specifications

This appendix provides the following information:

- [General specifications](#), page 100
- [Weight and physical dimensions](#), page 102
- [Facility requirements](#), page 103
- [Environmental requirements](#), page 104
- [Data transmission ranges](#), page 105
- [Fibre Channel port specifications](#), page 107
- [Serial port specifications](#), page 107
- [Power supply specifications](#), page 109
- [Memory](#), page 110
- [Supported SFPs](#), page 111
- [Supported HBAs](#), page 111

General specifications

Table 26 lists general specifications.

Table 26 General specifications

Specification	Description
Configurable port types	F_Port, FL_Port, and E_Port
EMC emissions	<div>An operating SAN Switch conforms to the emissions requirements specified by the following regulations:</div> <ul style="list-style-type: none">• FCC Rules & Regulations, Part 15 subpart B, Class A• CSA C108.8 Class A• VCCI Class A ITE• CISPR 22 Class A• EN55022 Class A• AS/NZF 3548: 1995 Class A• Korean EMC Requirements• BSMI Standard CNS 13438• EMC Directive 89/336/EEC• EN5022 Level A• EN50082–2/EN55024: 1998

Table 26 General specifications (continued)

Specification	Description
EMC immunity	<ul style="list-style-type: none"> • IEC 61000–4–2 Severity Level 3 for Electrostatic Discharge • IEC 61000–4–3 Severity Level 3 for Radiated Fields • IEC 61000–4–4 Severity Level 3 for Fast Transients • IEC 61000–4–5 Severity Level 3 for Surge Voltage • IEC 61000–4–6 Conducted Emissions • IEC 61000–4–11 Voltage Variations • EN 61000–4–12 Oscillatory Waves Immunity • EN 61000–3–2 Limits for Harmonic Current Emissions • EN 61000–3–3 JEIDA
System architecture	Nonblocking shared-memory switch
System processor for the 2/8V, 2/16V and 2/16N	PPC405GP, 200 MHz CPU
System processor for the 4/32	PowerPC 440GP, 400 MHz CPU
ANSI Fibre Channel protocol	FC–PH (Fibre Channel Physical and Signalling Interface standard)
Modes of operation for the 2/8V, 2/16V and 2/16N	Fibre Channel Class 2, Class 3 and Class F
Modes of operation for the 4/32	Fibre Channel Class 2 and Class 3
Fabric initialization for the 2/8V, 2/16V and 2/16N	Complies with FC–SW 5.0
Fabric initialization for the 4/32	Complies with FC–SW–3 Rev. 6.6
FC–IP (IP over Fibre Channel)	Complies with FC–IP 2.3 of FCA profile
Aggregate switch I/O bandwidth for the 2/8V, 2/16V and 2/16N	64 Gb/s if all 16 ports are running at 2Gb/s, full duplex

Table 26 General specifications (continued)

Specification	Description
Aggregate switch I/O bandwidth for the 4/32	256 Gb/s if all 32 ports are running at 4 Gbps, full duplex
Port-to-port latency	Less than 2 microseconds with no contention (destination port is free)

Weight and physical dimensions

Table 27 lists weight and physical dimensions.

Table 27 SAN Switch specifications

	SAN Switch 2/8V	SAN Switch 2/16V and SAN Switch 2/16N	SAN Switch 4/32
Height	1.69 in (4.29 cm)	1.69 in (4.29 cm)	1.67 in (42.44 mm)
Width	16.87 in (42.85 cm)	16.87 in (42.85 cm)	16.89 in (429 mm)
Depth	12.10 in (30.734 cm)	12.10 in (30.734 cm)	23.0 in (584.2 mm)
Weight	8.2 lb (3.72 kg) with no media installed	9.4 lb (4.27 kg) with no media installed	22.4 lb (10.16 kg) with two power supplies and three fan assemblies installed

Facility requirements

To ensure correct operation of the switch, the facility where the switch is in use must meet the requirements shown in [Table 28](#).

Table 28 Facility requirements

Type	Requirements
Electrical	<p>Primary AC Input 100-240 VAC, 1.5A, 47-63 Hz (SAN Switch 2/8V) and 100-240 VAC, 2.0A, 47-63 Hz (SAN Switch 2/16V and SAN Switch 2/16N) and 47-63Hz (SAN Switch 4/32) switch autosenses input voltage</p> <p>Adequate supply circuit, line fusing, and wire size, as specified by the electrical rating on the switch nameplate</p> <p>Circuit protected by a circuit breaker and grounded in accordance with local electrical codes.</p>
Thermal	<p>SAN Switch 2/8V, SAN Switch 2/16V, SAN Switch 2/16N: A minimum air flow of 24 cubic ft/minute available in the immediate vicinity of the switch</p> <p>SAN Switch 4/32: A minimum air flow of 47 cubic ft/minute available in the immediate vicinity of the switch</p> <p>Ambient air temperature not exceeding 40× C (104× F) while the switch is operating</p>
Cabinet (when rack-mounted)	<p>One rack unit in a 19-in. (48.3 cm.) cabinet</p> <p>All equipment in cabinet grounded through a reliable branch circuit connection</p> <p>Additional weight of switch must not exceed the cabinet's weight limits</p> <p>Cabinet must be secured to insure stability in case of unexpected movement, such as an earthquake</p>

Environmental requirements

To ensure proper operation, the switch must not be subjected to environmental conditions beyond those for which it was tested. The ranges specified in [Table 29](#) list the acceptable environment for both operating and non-operating conditions.

Table 29 Environmental requirements

Condition	Acceptable range during operation	Acceptable range during non-operation
Ambient Temperature	-10× to +40× C (12× to 122× F)	-50× to 100× C (-122× to 212× F)
Humidity	20% to 85% RH non-condensing, at 40×C, with maximum gradient of 10% per hour	10% to 85% RH noncondensing, at 70° C
Altitude	0 to 10,000 ft (3 km) above sea level	0 to 39,370 ft (12 km) above sea level
Shock	20 G, 6 ms duration, half sine wave	15 G, 12-18 ms duration, trapezoid
Vibration	0.5 G, 5-500 Hz	2.0 G, 5-500 Hz
Air flow	24 cubic ft/minute	None required



NOTE: The -10°- 40° Celsius range applies to the ambient air temperature at the air intake vents on the nonport side of the switch. The temperature inside the switch can be up to 75° Celsius during switch operation.

If the internal temperature range exceeds the operating ranges of the components, the LEDs, error messages, and Fabric Watch alerts will indicate a problem. Enter the `tempshow` commands to view temperature status.

Data transmission ranges

Refer to [Table 30](#) and [Table 31](#) for SAN Switches data transmission ranges.

Data transmissions for the 2/8V, 2/16V and 2/16N

[Table 30](#) lists data transmission ranges for different cable types and port speeds.

Table 30 Laser data transmission ranges for the 2/8V, 2/16V and 2/16N

Port speed	Cable	Short wavelength	Long wavelength
1 Gb/sec	50μ	1,640 ft. (500 m.)	n/a
1 Gb/sec	62.5μ	984 ft.(300 m.)	n/a
1 Gb/sec	9μ	n/a	6.2 miles (10 km) Optional Long Wave SFPs are required.
2 Gb/sec	50μ	984 ft.(300 m.)	n/a
2 Gb/sec	62.5μ	492 ft.(150 m.)	n/a
2 Gb/sec	9μ	n/a	6.2 miles (10 km) without an HP Extended Fabrics license; 50 to 100 km with a HP Extended Fabrics license.

Data transmissions for the 4/32

[Table 31](#) lists data transmission ranges for different cable types and port speeds.

Table 31 Laser data transmission ranges for the 4/32

Port speed	Cable size (microns)	Short wavelength (SWL)	Long wavelength (LWL)	Extended long wavelength (ELWL)
1 Gbps	50	1,640 feet (500 m)	6.2 miles (10 km)	N/A
	62.5	984 feet (300 m)	6.2 miles (10 km)	N/A
	9	N/A	6.2 miles (10 km)	24.8 miles (40 km)

Table 31 Laser data transmission ranges for the 4/32 (continued)

Port speed	Cable size (microns)	Short wavelength (SWL)	Long wavelength (LWL)	Extended long wavelength (ELWL)
2 Gbps	50	984 feet (300 m)	6.2 miles (10 km)	N/A
	62.5	492 feet (150 m)	6.2 miles (10 km)	N/A
	9	N/A	10 km (6.2 miles) without an HP Extended Fabrics license; 50 to 100 km with an HP Extended Fabrics license	24.8 miles (40 km)
4 Gbps	50	492 feet (150 m)	N/A	N/A
	62.5	230 feet (70 m)	N/A	N/A
	9	N/A	N/A	N/A

Fibre Channel port specifications

The following sections summarize Fibre Channel Port specifications.

2/8V, 2/16V and 2/16N Fibre Channel port specifications

The Fibre Channel ports in the 2/8V, 2/16V and 2/16N are compatible with SWL and LWL SFP transceivers. The strength of the signal is determined by the type of transceiver in use.

The ports operate at 2.125 Gb/sec or 1.0625 Gb/sec, and autosense to the highest speed of all attached devices.

4/32 Fibre Channel port specifications

The Fibre Channel ports in the SAN Switch 4/32 are compatible with SWL, LWL, and ELWLW SFP transceivers. The strength of the signal is determined by the type of transceiver in use.

The ports are capable of operating at 1, 2, or 4 Gbps and are able to autonegotiate to the higher of 1 or 2 Gbps. Operation at 4 Gbps must be set manually.

Serial port specifications

The serial port is located on the port side of the switch. It is a three-wire RS-232 port with a DB-9 male connector, designed to connect to a DTE port.



NOTE: To protect the serial port from dust and ESD, keep the cover in place on the serial port when the port is not in use.

The serial port can connect to a computer workstation to configure the switch IP address without connecting to the fabric. The serial port's parameters are fixed at 9600 baud, 8 data bits, and no parity, with flow control set to `None`.

The port requires a straight serial cable with a female 9-pin subminiature-D connector. Only pins 2, 3, and 5 are supported.

Table 32 describes the cable pinouts.

Table 32 Cabling pinouts

Pin	Signal	Description
1	Not supported	Not supported
2	RxData	Receive data
3	TxData	Transmit data
4	Not supported	Not supported
5	GND	Logic ground
6	Not supported	Not supported
7	Not supported	Not supported
8	Not supported	Not supported
9	Not supported	Not supported

A 10-foot (3.0-m) serial cable is provided with the switch. It can be converted from a DB-9 serial cable to an RJ-45 serial cable by removing the adapter on the end of the cable.

To remove the adapter from the end of the DB-9 serial cable:

1. Ensure the cable and both screws have been disengaged.
2. Pull the adapter straight out, without moving it from side to side, to loosen seating of the connector. If you move the adapter side to side, you might damage the it.



CAUTION: When removing the DB-9 male connector from the DTE port, do not use excessive force; otherwise the DB-9 connector will split into two parts easily so that the switch's DTE port is not damaged.

Power supply specifications

The power supplies are universal and capable of functioning worldwide without using voltage jumpers or switches. They meet IEC 61000-4-5 surge voltage requirements and are autoranging in terms of accommodating input voltages and line frequencies. Each power supply integrates its own built-in fan for cooling, pushing the air toward the port side of the switch.

Table 33 lists the power supply specifications.

Table 33 Power supply specifications

Specification	Value
Outlet	Correctly wired and earth-grounded
Maximum output from each power supply	SAN Switch 2/8V: 50 watts, with fans operating SAN Switch 2/16V and SAN Switch 2/16N: 75 watts, with fans operating SAN Switch 4/32: 300 watts, with internal fans operating
Maximum system power consumption	SAN Switch 2/8V, 2/16V and SAN Switch 2/16N: 90 - 264 watts (depending on transceiver vendor) SAN Switch 4/32: 100 Watts
Input voltage	SAN Switch 2/8V, 2/16V and SAN Switch 2/16N: 100 - 240 VAC (nominal 80% efficiency), autoranging SAN Switch 4/32: 90 to 264 VAC (nominal 80% efficiency), autoranging
Input line frequency for all SAN Switches	SAN Switch 2/8V, 2/16V and SAN Switch 2/16N: 47 - 63 Hz SAN Switch 4/32: Active power factor correction per EN61000-3-2
Harmonic distortion	Active power factor correction per IEC1000-3-2

Table 33 Power supply specifications (continued)

Specification	Value
BTU rating	SAN Switch 2/8V: 120 BTU SAN Switch 2/16V and SAN Switch 2/16N: 266 BTU SAN Switch 4/32: 417 BTU
Inrush current	SAN Switch 2/8V: 20A SAN Switch 2/16V and SAN Switch 2/16N: 25A SAN Switch 4/32: 15A
Input line protection	Fused in both hot and neutral lines, using independent fuses.

Memory

Table 34 lists SAN Switch 2/8V, SAN Switch 2/16V and SAN Switch 2/16N memory.

Table 34 2/8V, 2/16V and 2/16N Memory specifications

Memory type	Install memory
Main Memory (SDRAM)	128 MB
Kernel Flash	16 MB
Boot Flash	512 KB
Compact Flash	256 MB

Table 35 lists SAN Switch 4/32 memory.

Table 35 4/32 Memory specifications

Memory type	Install memory
Main Memory (SDRAM)	512 MB to 1 GB
Kernel Flash	16 MB
Boot Flash	4 MB
Compact Flash	512 MB

Supported SFPs

Do not use non-supported SFPs, as these can affect switch operability. They might not fit correctly and could void your warranty. See “[SAN Switch optional kits](#)” on page 28 for a list of supported SFPs.

For a complete list of supported devices, refer to the *HP StorageWorks SAN design reference guide*:

<http://h18000.www1.hp.com/products/storageworks/san/documentation.html>

Supported HBAs

For a list of HBAs that have been tested and are known to work with the SAN Switches, refer to the latest version of the *HP StorageWorks SAN design reference guide*:

<http://h18000.www1.hp.com/products/storageworks/san/documentation.html>

Glossary

A

- AL_PA** Arbitrated loop physical address. A unique 8-bit value assigned during loop initialization to a port in an arbitrated loop.
- alias server** A fabric software facility that supports multicast group management.
- API** Application programming interface. A defined protocol that allows applications to interface with a set of services.
- AW_TOV** Arbitration wait time-out value. The minimum time an arbitrating L_Port waits for a response before beginning loop initialization.

B

- backup FCS switch** Backup fabric configuration server switch. The switch or switches assigned as backup in case the primary FCS switch fails.
- bandwidth** The total transmission capacity of a cable, link, or system. Usually measured in bps (bits per second). May also refer to the range of transmission frequencies available to a link or system.
- broadcast** The transmission of data from a single source to all devices in the fabric, regardless of zoning.
- buffer-to-buffer flow control** Management of the frame transmission rate in either a point-to-point topology or in an arbitrated loop.

C

- CLI** Command line interface. Interface that depends entirely on the use of commands, such as through telnet or SNMP, and does not involve a GUI.
- compact flash** Flash (temporary) memory that is used in a manner similar to hard disk storage. It is connected to a bridging component which connects to the PCI bus of the processor. Not visible within the processor's memory space.

on	<p>The way in which a system is set up. May refer to hardware or software.</p> <p>Hardware: The number, type, and arrangement of components that make up a system or network.</p> <p>Software: The set of parameters that guide switch operation. May include general system parameters, IP address information, domain ID, and other information. Modifiable by any login with administrative privileges.</p> <p>May also refer to a set of zones.</p>
CRC	Cyclic redundancy check. A check for transmission errors that is included in every data frame.
D	
data word	A type of transmission word that occurs within frames. The frame header, data field, and CRC all consist of data words.
defined zone configuration	The set of all zone objects defined in the fabric. May include multiple zone configurations.
DLS	Dynamic load sharing. Dynamic distribution of traffic over available paths. Allows for recomputing of routes when an Fx_Port or E_Port changes status.
domain ID	Unique identifier for all switches in a fabric, used in routing frames. Usually automatically assigned by the principal switch, but can be assigned manually. The domain ID for an HP switch can be any integer between 1 and 239. Generally, the default domain ID is 1.

E

E_D_TOV	Error detect time-out value. The minimum amount of time a target waits for a sequence to complete before initiating recovery. Can also be defined as the maximum time allowed for a round-trip transmission before an error condition is declared.
E_Port	Expansion port. A type of switch port that can be connected to an E_Port on another switch to create an ISL.
EE_Credit	End-to-end credit. The number of receive buffers allocated by a recipient port to an originating port. Used by Class 1 and 2 services to manage the exchange of frames across the fabric between source and destination.
EIA rack	A storage rack that meets the standards set by the Electronics Industry Association.
enabled zone configuration	The currently enabled configuration of zones. Only one configuration can be enabled at a time.
end-to-end flow control	Governs flow of class 1 and 2 frames between N_Ports.
error	As applies to fibre channel, a missing or corrupted frame, time-out, loss of synchronization, or loss of signal (link errors).
exchange	The highest level fibre channel mechanism used for communication between N_Ports. Composed of one or more related sequences, and can work in either one or both directions.

F

F_Port	Fabric port. A port that is able to transmit under fabric protocol and interface over links. Can be used to connect an N_Port to a switch.
fabric	A fibre channel network containing two or more switches in addition to hosts and devices. May also be referred to as a switched fabric.
fabric name	The unique identifier assigned to a fabric and communicated during login and port discovery.
FCIA	Fibre Channel Industry Association. An international organization of fibre channel industry professionals. Among other things, provides oversight of ANSI and industry developed standards.
FCP	Fibre channel protocol. Mapping of protocols onto the fibre channel standard protocols. For example, SCSI FCP maps SCSI-3 onto fibre channel.
FCS switch	Fabric Configuration Server Switch. One or more designated HP switches that store and manage the configuration and security parameters for all switches in the fabric.

fill word	An IDLE or ARB ordered set that is transmitted during breaks between data frames to keep the fibre channel link active.
FL_Port	Fabric loop port. A port that is able to transmit under fabric protocol and also has arbitrated loop capabilities. Can be used to connect an NL_Port to a switch.
FRU	Field-Replaceable Unit. A component that can be replaced on site.
FS	Fibre Channel Service. A service that is defined by fibre channel standards and exists at a well-known address. For example, the Simple Name Server is a fibre channel service.
FSP	Fibre channel service protocol. The common protocol for all fabric services, transparent to the fabric type or topology.
FSPF	Fabric shortest path first. HP's routing protocol for fibre channel switches.
Fx_Port	A fabric port that can operate as either an F_Port or FL_Port.

G

G_Port	Generic port. A port that can operate as either an E_Port or F_Port. A port is defined as a G_Port when it is not yet connected or has not yet assumed a specific function in the fabric.
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H

hard address	The AL_PA that an NL_Port attempts to acquire during loop initialization.
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I

idle	Continuous transmission of an ordered set over a fibre channel link when no data is being transmitted, to keep the link active and maintain bit, byte, and word synchronization.
integrated fabric	The fabric created by connecting multiple HP switches with multiple ISL cables, and configuring the switches to handle traffic as a seamless group.
ISL trunking	The distribution of traffic over the combined bandwidth of multiple ISLs. A set of trunked ISLs is called a "trunking group", and the ports in a trunking group are called "trunking ports".
isolated E_Port	An E_Port that is online but not operational due to overlapping domain IDs or nonidentical parameters (such as E_D_TOVs).

K

K28.5	A special 10-bit character used to indicate the beginning of a transmission word that performs fibre channel control and signaling functions. The first seven bits of the character are the comma pattern.
kernel flash	Flash (temporary) memory connected to the peripheral bus of the processor, and visible within the processor's memory space. Also known as “user flash”.

L

L_Port	<p>Loop port. A node port (NL_Port) or fabric port (FL_Port) that has arbitrated loop capabilities. An L_Port can be in one of two modes:</p> <p>Fabric mode: Connected to a port that is not loop capable, and using fabric protocol.</p> <p>Loop mode: In an arbitrated loop and using loop protocol. An L_Port in loop mode can also be in participating mode or non-participating mode.</p>
latency	The period of time required to transmit a frame, from the time it is sent until it arrives. Together, latency and bandwidth define the speed and capacity of a link or system.
link	As applies to fibre channel, a physical connection between two ports, consisting of both transmit and receive fibres.
link services	A protocol for link-related actions.
LIP	Loop initialization primitive. The signal used to begin initialization in a loop. Indicates either loop failure or resetting of a node.
LM_TOV	Loop master time-out value. The minimum time that the loop master waits for a loop initialization sequence to return.
loop failure	Loss of signal within a loop for any period of time, or loss of synchronization for longer than the time-out value.
loop initialization	The logical procedure used by an L_Port to discover its environment. Can be used to assign AL_PA addresses, detect loop failure, or reset a node.
Loop_ID	A hex value representing one of the 127 possible AL_PA values in an arbitrated loop.
LPSM	Loop Port State Machine. The logical entity that performs arbitrated loop protocols and defines the behavior of L_Ports when they require access to an arbitrated loop.
LWL	Long wavelength. A type of fiber optic cabling that is based on 1300nm lasers and supports link speeds up to 2 Gbit/sec. May also refer to the type of transceiver.

M

master port	The port that determines the routing paths for all traffic flowing through a trunking group. One of the ports that is in the first ISL in the trunking group is designated as the master port for that group.
MIB	Management Information Base. An SNMP structure to help with device management, providing configuration and device information.
multicast	The transmission of data from a single source to multiple specified N_Ports (as opposed to all the ports on the network).

N

N_Port	Node port. A port on a node that can connect to a fibre channel port or to another N_Port in a point-to-point connection.
name server	Frequently used to indicate Simple Name Server.
NL_Port	Node loop port. A node port that has arbitrated loop capabilities. Used to connect an equipment port to the fabric in a loop configuration through an FL_Port.
node	A fibre channel device that contains an N_Port or NL_Port.
non-participating mode	A mode in which an L_Port in a loop is inactive and cannot arbitrate or send frames, but can retransmit any received transmissions. This mode is entered if there are more than 127 devices in a loop and an AL_PA cannot be acquired.
Nx_Port	A node port that can operate as either an N_Port or NL_Port.

P

packet	A set of information transmitted across a network.
participating mode	A mode in which an L_Port in a loop has a valid AL_PA and can arbitrate, send frames, and retransmit received transmissions.
path selection	The selection of a transmission path through the fabric. HP switches use the FSPF protocol.
phantom address	An AL_PA value that is assigned to an device that is not physically in the loop. Also known as phantom AL_PA.
phantom device	A device that is not physically in an arbitrated loop but is logically included through the use of a phantom address.
PLOGI	Port login. The port-to-port login process by which initiators establish sessions with targets.

point-to-point	A fibre channel topology that employs direct links between each pair of communicating entities.
port cage	The metal casing extending out of the fibre channel port on the switch, and into which a GBIC or SFP transceiver can be inserted.
Port_Name	The unique identifier assigned to a fibre channel port. Communicated during login and port discovery.
POST	Power On Self-Test. A series of tests run by a switch after it is powered on.
primary FCS switch	Primary fabric configuration server switch. The switch that actively manages the configuration and security parameters for all switches in the fabric.
private loop	An arbitrated loop that does not include a participating FL_Port.
private NL_Port	An NL_Port that communicates only with other private NL_Ports in the same loop and does not log into the fabric.
public device	A device that supports arbitrated loop protocol, can interpret 8-bit addresses, and can log into the fabric.
public loop	An arbitrated loop that includes a participating FL_Port, and may contain both public and private NL_Ports.
public NL_Port	An NL_Port that logs into the fabric, can function within either a public or a private loop, and can communicate with either private or public NL_Ports.

Q

quad	A group of four adjacent ports that share a common pool of frame buffers.
-------------	---

R

R_A_TOV	Resource allocation time-out value. The maximum time a frame can be delayed in the fabric and still be delivered.
RAID	Redundant Array Of Independent Disks. A collection of disk drives that appear as a single volume to the server and are fault tolerant through mirroring or parity checking.
request rate	The rate at which requests arrive at a servicing entity.
route	As applies to a fabric, the communication path between two switches. May also apply to the specific path taken by an individual frame, from source to destination.
routing	The assignment of frames to specific switch ports, according to frame destination.
RR_TOV	Resource recovery time-out value. The minimum time a target device in a loop waits after a LIP before logging out a SCSI initiator.

RSCN Registered state change notification. A switch function that allows notification of fabric changes to be sent from the switch to specified nodes.

S

SAN Storage Area Network. A network of systems and storage devices that communicate using fibre channel protocols.

SDRAM The main memory for the switch.

sequence A group of related frames transmitted in the same direction between two N_Ports.

service rate The rate at which an entity can service requests.

single mode The fiber optic cabling standard that corresponds to distances of up to 10 km between devices.

SNMP Simple Network Management Protocol. An internet management protocol that uses either IP for network-level functions and UDP for transport-level functions, or TCP/IP for

both. Can be made available over other protocols, such as UDP/IP, because it does not rely on the underlying communication protocols.

SNS	Simple Name Server. A switch service that stores names, addresses, and attributes for up to 15 minutes, and provides them as required to other devices in the fabric. May also be referred to as directory service.
switch	Hardware that routes frames according to fibre channel protocol and is controlled by software.
switch port	A port on a switch. Switch ports can be E_Ports, F_Ports, or FL_Ports.
SWL	Short wavelength. A type of fiber optic cabling that is based on 850nm lasers and supports link speeds up to 2 Gbit/sec. May also refer to the type of transceiver.

T

tenancy	The time from when a port wins arbitration in a loop until the same port returns to the monitoring state. Also referred to as loop tenancy.
throughput	The rate of data flow achieved within a cable, link, or system. Usually measured in bps (bits per second).
topology	<p>As applies to fibre channel, the configuration of the fibre channel network and the resulting communication paths allowed. There are three possible topologies:</p> <p>Point to point: A direct link between two communication ports.</p> <p>Switched fabric: Multiple N_Ports linked to a switch by F_Ports.</p> <p>Arbitrated loop: Multiple NL_Ports connected in a loop.</p>
transmission character	A 10-bit character encoded according to the rules of the 8b/10b algorithm.
transmission word	A group of four transmission characters.
trap (SNMP)	The message sent by an SNMP agent to inform the SNMP management station of a critical error.

U

U_Port	Universal port. A switch port that can operate as a G_Port, E_Port, F_Port, or FL_Port. A port is defined as a U_Port when it is not connected or has not yet assumed a specific function in the fabric.
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W

well-known address	As pertaining to fibre channel, a logical address defined by the fibre channel standards as assigned to a specific function, and stored on the switch.
workstation	A computer used to access and manage the fabric. May also be referred to as a management station or host.
WWN	World Wide Name. An identifier that is unique worldwide. Each entity in a fabric has a separate WWN.

Z

zone	A set of devices and hosts attached to the same fabric and configured as being in the same zone. Devices and hosts within the same zone have access permission to others in the zone, but are not visible to any outside the zone.
zone configuration	A specified set of zones. Enabling a configuration enables all zones in that configuration.

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